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ABSTRACT

The effects of globalization and rapid technological change on emerging occupational patterns in Australia need to be understood in order to understand their implications for the effects on education and vocational training. Building on the classification scheme introduced by Robert Reich in his 1992 book, the Work of Nations, Australian employment data was analyzed in terms of the following nine proposed occupational categories: symbolic analytic services (conceptual and technical); in-person services (professional, intermediate, elementary); and routine production services (advanced skill, white collar, blue collar, low skill). Analyzing the changes in the data from 1986 to 1996 lead to the following conclusions: (1) the impact of the globalization of the world economy and rapid technological advancement on employment in Australia has generally been more negative than positive; (2) polarization of attachment to Australia's labor force has increased over the past decade; (3) although the employment picture has generally improved for Australia's female workers, employment growth has been sluggish for males; (4) Australia's universities must improve their performance as a major source of symbolic analysts; (5) Australia's technical and further education (TAFE) sector must increase its effectiveness in preparing people for employment as in-person service workers and conceptual symbolic analysts; and (6) the TAFE and VET (vocational education and training) sectors must clearly define the pathways between them and develop imaginative cooperative programs. (The report contains 29 references and 18 tables/figures. Nine additional tables are appended.) (MN)

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Emerging occupational patterns in Australia in the era of globalisation and rapid technological change: Implications for education and training

Leo Maglen and Chandra Shah

February 1999

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Emerging occupational patterns in Australia in the era of globalisation and rapid technological change: Implications for education and training

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Abstract

In the past decade the Australian economy has been increasingly subjected to the forces of globalisation and other macro and micro structural reforms. This report attempts to document the effect of these changes on the occupational pattern of employment. Currently occupations are classed using the Australian Standard Classification of Occupations (ASCO) code. However this official classification code fails to capture new and emerging patterns especially in times of rapid economic and technological change. To capture these changes a new paradigm is developed to classify occupations. The classification builds on the 1992 work of Robert Reich: *The Work of Nations*. The results of the study raise a number of questions about the role of education and training in the currently rapidly changing economic and social environment that we live in.

1 Introduction

Since the 1960s there have been substantial social changes around the world, and especially in industrialised countries, that can be attributed to, in part, global economic restructuring and rapid technological progress. Sociologists have developed a number of frameworks to study these phenomena. For example, Touraine (1971) and Bell (1973) heralded the dawn of *post-industrialism. Deindustrialization* is another term that has been used to describe this phenomenon, see Rowthorn and Ramaswamy (1997); and Porat (1975, 1976, 1977), referred to it as the growth of the *information economy*, see also Boisot (1998). However, the concept of the *information economy* is very much related to that of a *knowledge-based economy* on which Fritz Machlup did seminal work in 1962. He published this work under the title: *The Production and Distribution of Knowledge in the United States*. Since the mid-1980s the term *globalisation* has become popular among analysts and commentators. Originally it was mainly applied to the processes of freeing up international trade and the reduction in trade barriers between countries that led up to the World Trade Agreement. Latterly it has come to mean much more than that.

Globalisation is now an all-encompassing term used to explain a range of economic or social changes, which cannot be explained strictly by domestic or national events or causes. It has social, cultural, political, environmental and economic dimensions. The multi-dimensional nature of the concept means that it is difficult to define, so its exact meaning still remains unclear.

The economic dimension of globalisation has attracted the most attention of researchers and commentators. But even here there is no agreement on its definition, and many consider the notions behind it to be fuzzy, subjective and ill defined. The OECD (1992b) report *Technology and the Economy* grappled with this term and came up with the following definition:

> *Globalisation represents a new phase in the process of internationalisation and the spread of international production. It refers to a set of emerging conditions in which value and wealth are increasingly being produced and distributed within worldwide corporate networks.*

What this implies is an increasing interdependence of markets and production in different geographical locations, through trade in goods and services, technology transfers and high mobility of capital. It also implies an increase in the international division of labour as a consequence of an accelerated tendency towards the world-wide fragmentation of production processes.

The starkest and most visible effects of globalisation have been the dramatic changes in the money and capital markets. Financial deregulation since the 1970s (and since the mid-1980s in Australia) and major technological advances, especially in

telecommunication and computing, have greatly speeded up the process of globalisation.

As the OECD (1992b) report notes, some of the other visible aspects of globalisation are:

- the very rapid growth of foreign direct investment (FDI) in national economies;
- the predominance of FDI over trade in the key area of services;
- the role played by multi-national enterprises (MNE) in world trade and the present volume of intra-firm trade; and
- the emergence of highly concentrated international supply structures of global oligopoly as a result of restructuring and cross-border mergers and acquisitions.

The principle of comparative advantage that applies to international trade is also the guiding principle that firms employ to develop globalisation strategies. They aim, as ever, to maximise profits within certain constraints. As Nunnenkamp et al. (1994, p2) put it:

> *globalisation can be viewed as an entrepreneurial response to a changing environment, while the leitmotiv of firm behaviour - constrained profit maximisation - remains unchanged.*

As constraints are weakened or removed new opportunities for profits become available. To exploit these opportunities firms develop new strategies. The deregulation of world financial markets and major technological advances in transport and communication has resulted in factors of production becoming highly mobile. Labour is the least geographically mobile factor, particularly at the unskilled level. So firms' decisions to locate plants are increasingly made on the basis of cost and availability of labour, but also on the basis of the local entity, be it a local authority, city, state or country, that offers the most fiscal benefits and least regulatory constraints. Proximity to markets is becoming less important as the markets become global and production more and more fragmented. Moreover, location has also become much less of a consideration for those possessing many of the skills and knowledge that are highly valued in the emerging global labour markets of the information and knowledge-based economy. Electronic communications and international air travel are all that are needed to bring buyers and sellers of these services together.

Though international division of labour has always accompanied growth in international trade, globalisation has added an extra dimension to it, and has provided new opportunities for specialisation. As Castells (1993) points out, globalisation has meant less sectoral specialisation, and more intra-product, intra-organisational division of labour into high-level and low-level technology occupations. As a consequence, opportunities, rewards and the nature of work for skilled and unskilled labour in industrialised countries are increasingly diverging. Within each category of workers there is likely to be differences too, for example, not all skilled workers may have the same level of exposure to the forces of globalisation.

Some of the strongest empirical evidence in support of the *post-industrialism* and the *information* or *knowledge-based economy* has been the shift in the employment and occupational structure of developed economies. Bell (1973) forecasted a move away from a manufacturing to a service-based economy, in which the professional and technical class would be pre-eminent, as economies made the transition into the *post-industrial* age. It can be questioned, however, whether globalisation has merely accelerated this process, or whether a new pattern of employment and occupations is emerging as a consequence of it.

If we accept a nation state's economy to have been affected by globalisation, then the question arises as to the nature and extent of the impact that globalisation and its attendant rapid technological change, and the organisational responses to these forces, have had on its labour force. We can expect some structural changes to have occurred, and certain trends to have emerged, in the patterns of employment and occupations.

In this paper we explore this issue in the context of Australia's experience, by analysing its labour force data for the past decade.

Australia, being a first world industrial country, can be thought of as experiencing *post-industrialisation* and *globalisation*, and its economy becoming more *knowledge-based*. Up to the 1980s, the Australian economy relied predominantly on the mining and agriculture sectors to provide export income. Tariff protection shielded local manufacturing industries from outside competition. The small domestic economy and a lack of incentive to seek export markets, were barriers to potential economies of scale, and investment in research and development and new technology. Since the mid-1970s the Australian economy has been opened up. Tariff barriers have been reduced and, since the mid-1980s, the dollar has been floated, the financial sector has been deregulated and opened to foreign participants, and foreign investment regulations eased. Australia has become fully integrated into the emerging global economy.

According to the OECD report, *Structural Change and Industrial Performance*, OECD (1992a), real output share for manufacturing in Australia declined between the mid-1970s and mid-1980s in line with that for Canada, France, Germany, the UK and the USA. Amongst the leading industrialised countries, only in Japan did it increase. All countries recorded a decline in the low technology sector of manufacturing but, with the exception of Australia, they all recorded an increase in the high technology sector. The report also shows that by the mid-1980s, Australia had around 65 percent of its output originating in the services sector, a figure which was 10 percentage points more than that for Japan. The extent to which Australia has been opened up to international competitive forces, and how it has fared as a consequence, is reviewed in a number of places, see, for example, Dao et al. (1993), BIE (1993), McKinsey and Company (1993), Lloyd (1995), OECD (1996), Mortimer (1997).

If changes have occurred in the employment and occupation structure of the Australian labourforce, directly or indirectly as a consequence of globalisation, and if they are significant, then it is important to document them. Amongst other things, they could have policy implications in the areas of education and training. In the next section we review previous work on measuring the information economy, as well as new

paradigms for the observation of changes in employment that has occurred over the last decade or so. In section 3 we develop revised occupational frameworks to analyse these changes. The revision we propose is an enhancement of the classification that Reich (1992) suggests in *The Work of Nations*. In section 4 the Australian labour force survey data from 1986 to 1996 are analysed using this framework. In the final section we discuss the results and draw out their implications for education and training.

2 Previous research

It is generally the case that new concepts or processes are defined before instruments to measure their effects are developed. Machlup (1962) defined, and attempted to measure, education, research and development, information machinery and information activities as *knowledge industries*. He found that to measure the information, or knowledge-based, sector of the economy, the existing classifications were inadequate. Many activities in the information sector cross the traditional industrial boundaries. There has also been blurring of the lines between the traditional industrial sectors themselves, for example, between manufacturing and services, thereby limiting the utility of the separation. The OECD (1992a, p 78) gives the following example to illustrate the point:

> *In terms of inputs, one of the single largest suppliers to General Motors (GM) is not a steel or glass company, but a health care provider, Blue Cross-Blue Shield. This input cost GM over US$2.2 billion in 1983 and covered over 2 million people.... In terms of output, one of the largest GM "products" is financial service. GM finances the purchase of many of the cars it makes. In 1985, over 20 percent of GM's profits were from GM's finance division, GMAC. After sales service standards such as 24-hour roadside repairs have also risen, so that the service component of GM's cars has increased.*

Official national agencies collect statistics for a wide variety of purposes and to meet the needs of a broad range of users. In seeking to do this there is a risk that the resulting classification structures are not really suited to any particular purpose. Moreover, official statisticians only rarely change the classification systems for the data they collect. They need to maintain continuity with past collections, and reclassification is a complicated, lengthy and expensive process. This applies as much to occupational statistical collection as it does in any other sphere.

Layard et al. (1971) found the official classification of occupations inadequate for studying inter-plant employment of skilled labour in the electrical engineering industry in the United Kingdom. Instead, they developed a four-dimensional classification using function (e.g. sales), management level (e.g. middle-level manager), level of knowledge (e.g. technologist) and field of knowledge (e.g. electronics). Porat (1977) similarly found the official occupational classification system unsuited to his purposes, when investigating the nature and growth in the information sector in the United States. Since he found that the information activities in the economy transcended the traditional industry and occupation boundaries of the classification systems used by official government data collecting agencies, he developed a new typology to deal with its measurement. This typology has often formed the basis for other work such as that conducted by the OECD, see OECD (1981, 1986). Carnevale and Rose (1998) in their study of *The New Office Economy*, reclassified jobs, firstly into those located in offices, factories, farms, behind counters, and in hospitals and classrooms, and secondly, with the former, into 'elite', 'good' and 'less-skilled' occupations.

Similar difficulties are experienced with official occupational classifications when it comes to mapping and analysing the impact of globalisation upon patterns of employment. As did Porat, Reich (1992) found that the way the U.S. Bureau of Census classified jobs was inadequate for his diagnosis of the sea-change he sees occurring in the nature of work in the United States as the forces of globalisation take effect. In its place Reich suggests that a three-way classification of the jobs people do is more appropriate as an indicator of how and to what extent they are, and will be increasingly, open to change in the future. The terms he coins for these three categories are symbolic analytic services, in-person services and routine production services.

Symbolic analytic services, as the term suggests, involve the manipulation of symbols – numerical, visual, scientific, musical, electronic symbols – as their major component. They include problem-identifying, problem-solving and strategic-broking activities. These services can be traded globally, and thus must compete with foreign providers even in the domestic market. *In-person services* are those which are provided person-to-person. In-person servers are in direct contact with the ultimate beneficiaries of their work. In general, the market for these services is domestic, even local, but rarely global. *Routine production services* typically entail work (both white and blue collar work) that is repetitive and done one step at a time. Workers providing these services are often employed in high volume enterprises whose finished products are traded on the global market. Their positions in the global market are the most precarious of the three groups.

Starting from occupation titles defined at the lowest level in the U.S. Department of Labour's *Dictionary of Occupation Titles* (*DOT*) U.S. Bureau of Labor (1991), Reich re-ordered the occupations according to which of the three functional groups they appeared to belong. He did not classify farmers, miners and extractors of other natural resources into any of the three groups. He also excluded government employees, employees in regulated industries (like utility workers) and government-financed workers (like those working on defence weapons systems and Medicaid). No explanation was given for excluding the first group, but he considered the second group to be immune from global competition.

In this way Reich classified three out of four American jobs into the three functional categories and created the *other* category for the remaining 25 percent of jobs. Accordingly, Reich found the share of employment of symbolic analysts in America to be 20 percent in 1990, having increased most rapidly in the period 1950 to 1980 and more slowly after that. The share of in-person service workers in America was 30 percent in 1990, and it also showed an increasing trend. Routine production workers' share of employment in America was 25 percent in 1990, and was in decline.

Maglen (1994) using published labour force survey data, and Maglen and Shah (1995) using data from one-percent samples taken from the 1986 and 1991 censuses, adapted Reich's three-way classification of occupations to analyse trends in Australian employment. Both studies allocated each occupation class at the minor group (2-digit) level as defined in the first edition of the *Australian Standard Classification of Occupations (ASCO)*, Australian Bureau of Statistics (1990), into one of the three Reichian categories. Unlike Reich's work that covered three out of four American

workers, these studies covered all working persons in the Australian labour force. The latter showed that the employment numbers of symbolic analysts had increased at an annual rate of 4.6 percent between 1986 and 1991, and that in-person service worker numbers had also grown, but only at a rate of 1.4 percent. The number of routine production workers had fallen from being 41 percent of the workforce in 1986 to 36 percent in 1991.

Although the results from these studies were illuminating, they also revealed some deficiencies in the model. In particular, the occupations as defined at the 2-digit level in the first edition of ASCO did not allow sufficient differentiation in accordance with the Reichian classification, so that some occupational classes appeared to belong in more than one category. Additional problems arose with respect to the group membership of those workers whom Reich had put in the *other* category, whom the authors sought to distribute amongst the three major categories.

In the following section we further refine the Reichian classification to take account of some of the difficulties we encountered in our previous studies. Moreover we apply it to a more disaggregated occupational base, and to a ten year series of annual data.

3 A new classification of occupations

ASCO (first edition) employed a four-level hierarchical classification of all jobs performed by members of the Australian labour force. Table 1 shows the number of occupational groups at each level.

Table 1 Number of occupational groups in the four-level ASCO (first edition)

Level	Number of groups
Occupation (6-digit)	1079
Unit Group (4-digit)	282
Minor Group (2-digit)	52
Major Group (1-digit)	8

The highest level of aggregation, the one-digit major grouping of occupations, sorts jobs into the following eight categories:

1. Managers and Administrators
2. Professionals
3. Para-professionals
4. Tradespersons
5. Clerks
6. Salespersons and Personal Service Workers
7. Plant and Machine Operators and Drivers
8. Labourers and Related Workers

Such a classification, designed for general use, is of limited value for our purposes as it masks significant changes that are occurring in employment patterns over a period of rapid technological and global change.

What we propose is a nine-way reclassification of occupations that enables us to more effectively identify some of the major trends that have emerged in the structure of the Australian labour force over recent times.

The reclassification is as follows:

1. Symbolic analytic services (conceptual)
2. Symbolic analytic services (technical)
3. In-person services (professional level)
4. In-person services (intermediate level)
5. In-person services (elementary level)
6. Routine production services (advanced skill level)
7. Routine production services (intermediate level – white collar)
8. Routine production services (intermediate level – blue collar)
9. Routine production services (low-skill level).

This classification is based on two major criteria and one minor criterion. The two major criteria allow us to cross-classify occupations, the minor one is used to further subdivide one of the resulting sub-classifications. The criteria are:

(a) the three Reichian classifications;
(b) three skill levels;
(c) the distinction between white and blue-collar work.

Table 2 sets out the nine categories using these criteria.

Table 2 Proposed nine-way categorisation of occupations

	Reichian occupational categories		
Skill level	Symbolic analytic services	In-person services	Routine production services
High	1. Symbolic analytic services (conceptual)	3. In-person services (professional)	6. Routine production services (advanced-skill)
Intermediate	2. Symbolic analytic services (technical)	4. In-person services (intermediate)	7. Routine production services (white-collar)
			8. Routine production services (blue-collar)
Low		5. In-person services (elementary)	9. Routine production services (low-skill)

The Reichian occupational categories are retained from our previous studies because we believe they are fundamental to the analysis of changes brought about by globalisation and rapid technological change. The cross-classification by skill levels associated with occupations, however, enables us to both further identify changes that are occurring in the labour force, and to draw out some of the implications for education and training. The distinction between white and blue-collar components of the middle skill level of routine production services is also used for these purposes.

The 282 occupation groups at the four-digit level in ASCO (first edition) were reclassified using the above categorisation. Ideally we would have taken the 1079 occupations at the six-digit level as the basis of our analysis, but data at this level of

disaggregation are rarely available at any point of time, let alone as a time-series. Fortunately, there are few shifts of category when the criteria are applied at this level from those resulting at the four-digit level, so little has been lost by using the higher level of aggregation.

We have attempted to define the above nine categories so that they are as distinct as possible from each other. This should ensure most occupations fall in just one, and only one, category. However, all classification systems are arbitrary, and there are cases of ambiguity when an occupation can be considered to belong to more than one category. Such cases are resolved by focussing on the main work in that occupation. For example, bus and tram drivers' work could be considered, as providing routine production as well as in-person services, but the main focus of their work is that of providing in-person services, and hence the work would be classified in the latter category. On the other hand we are well aware that many tradespersons, especially those who are self-employed, deal directly with their clients, and hence have a strong in-person service element in their work. Nevertheless, as it was not possible to identify those in this position, we classified all of them as routine production workers. The allocation of the 282 unit group occupations to our nine categories is contained in the Appendix to this paper, Tables A1 to A9.

As with the ASCO major groups, our proposed nine-way reclassification of occupations is not industry specific, but cuts across all sectors of the economy. Table 3 indicates the extent to which it overlaps and differs from the ASCO major groupings.

The following is a more detailed description of each of the nine proposed new occupational categories.

1. Symbolic analytic services (conceptual)

This work primarily involves the manipulation of symbols in the form of data, words, audio and visual representations. It is mostly conceptual - involving creative and/or critical thought. It involves problem identifying and solving and strategic brokering. Persons employed to do this type of work are highly exposed to global competitive forces. However, it is generally the expertise and the product they can offer, and the speed, flexibility and adaptability they display, that are more important than their wages and other cost factors.

2. Symbolic analytic services (technical)

Although closely related to the above category, there are differences between the two. Their work is essentially at the technician and paraprofessional level in support of the conceptual symbolic analysts.

Table 3 Coverage of nine occupational categories by major ASCO* groups

	Occupational category								
	Symbolic analytic services		In-person services			Routine production services			
Major ASCO group	Conceptual	Technical	Professional	Intermediate	Elementary	Advanced-skill	White-collar	Blue-collar	Low-skill
Managers and administrators	X		X	X					
Professionals	X		X						
Para-professionals		X	X	X		X	X		
Tradespersons				X		X			
Clerks				X	X		X	X	
Salespersons and personal service workers				X	X				
Plant and machine operators and drivers					X			X	
Labourers and related workers					X				X

Note: A cross indicates the job category includes some or all occupations in the major ASCO group in the left-hand column.
* Major groups as defined in ASCO (first edition)

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3. In-person services (professional)

Professional in-person service work is also highly skilled, but its major characteristic is that it involves dealing face-to-face with the ultimate beneficiaries of the service. The beneficiaries include customers, clients, patients, pupils etc. Although this type of work is largely insulated from the forces of globalisation, the nature of some of the work is changing due to advances in communication and computing technologies and other technical areas. Some of the work of persons offering these services may involve symbolic analytic activities, but the main distinguishing feature is the personal nature of the work.

4. In-person services (intermediate)

The difference between the in-person services at the professional and intermediate level is the skill level. The skill requirements in this case are lower, and their nature more routine than that of the professional. As with the relationship between technical and conceptual symbolic analysts, that between intermediate and professional in-person service workers is often one of support.

5. In-person services (elementary)

Elementary in-person service work, whilst it too primarily involves dealing face-to-face with customers, clients, etc, is typically routine and often manual. The level of skill required is generally low. The work is often part-time or casual. A large number of persons doing this type of work are employed in the hospitality and tourism industry. These services are usually not traded on the global market and the demand for them is domestically driven. However, the strength of the demand depends upon the fortunes of those who do face global competition.

6. Routine production services (advanced-skill)

Routine production services at the advanced-skill level cover work that has been traditionally carried out by tradepersons and craftworkers. Automation has replaced a lot of their work. The work demands frequent upgrading of skills to cope with technological change. These services are not commonly traded on the global market. Some workers who provide these services, and especially in the manufacturing sector, are likely to be affected by globalisation, for example, when a firm relocates its manufacturing offshore to exploit cheaper labour costs and less restrictive local laws in another country. Others though, such as those in the construction industries, are less likely to be affected.

7. Routine production services (white-collar)

The traditional classification of white-collar routine production services would be clerical work, done mainly by people working behind a desk. However, automation and advances in telecommunication and computing have significantly affected the type of work they do now. Some of them have had to become multi-skilled to keep their jobs. In some instances this has involved providing some in-person services. For example, bank clerks have to be tellers as well as do the traditional clerical work. As alluded to earlier

in this section, this raises problems in accurately classifying their work, but overall the main focus of their work is still considered to be clerical.

8. Routine production services (blue-collar)

In contrast to the work involved in the previous job, this one includes work that has traditionally been classified as operative. This type of work has a high degree of exposure to both globalisation and automation. Blue-collar routine production workers are increasingly required to multi-skill in order to do work that was traditionally done by tradepersons.

9. Routine production services (low-skill)

The work of a low-skill routine production worker involves highly repetitive, labour intensive tasks. These require little skill. Both technological change and globalisation tend to affect the lot of workers providing these services.

4 Empirical results

In this section we examine the employment data for Australia for the nine categories to see how they have fared over the decade between 1986 to 1996. In particular, we compare the patterns in growth and distribution of their numbers by gender, age and hours worked.

The following analyses are based on unpublished Australian Bureau of Statistics (ABS) quarterly Labour Force Survey data, from August 1986 to May 1996. For the purpose of this study the data have been aggregated to obtain annual series, on a financial year basis. Total numbers of employed persons disaggregated by age, sex, hours worked and occupation at the 4-digit ASCO were available.

4.1 Employment by Occupational Category – 1995/96

Table 4 shows the pattern of employment in Australia in 1995/96 using our revised occupational classification. Total employment stood at just under 8.3 million. Whilst, overall, the routine production group of occupations was still the largest, comprising almost a half of all employed, the largest single category of occupations was that of elementary in-person service workers. Conceptual symbolic analysts and advanced-skill routine production workers closely followed this. The smallest of the new categories was that of technical symbolic analysts.

The patterns, however, were not the same for male and female workers, and this reflected the marked differences in gender balance between occupational categories. Amongst males, two high-skill categories of workers – advanced-skill routine production workers and conceptual symbolic analysts – accounted for 43 percent of the total, whilst for females, two lower-skill categories – elementary in-person service workers and white collar routine production workers – made up 49 percent of the total.

Table 4 Employment in the reclassified occupational categories, by sex, 1995/96

	Occupational category									
	Symbolic analytic services		In-person services			Routine production services				
	Conceptual	Technical	Professional	Intermediate	Elementary	Advanced-skill	White-collar	Blue-collar	Low-skill	All
	Employment level ('000)									
Males	926	139	238	422	442	1083	247	467	752	4716
Females	309	29	486	300	1002	100	760	158	427	3571
Persons	1236	168	725	722	1444	1183	1006	625	1178	8287
	Occupational category's share of employment									
Males	20%	3%	5%	9%	9%	23%	5%	10%	16%	100%
Females	9%	1%	14%	8%	28%	3%	21%	4%	12%	100%
Persons	15%	2%	9%	9%	17%	14%	12%	8%	14%	100%
	Gender share of employment									
Males	75%	83%	33%	58%	31%	92%	25%	75%	64%	57%
Females	25%	17%	67%	42%	69%	8%	75%	25%	36%	43%

Source: ABS Labour Force Surveys, Catalogue No. 6203.0 (unpublished)

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For the labour force as a whole, the male to female ratio of employment in 1995/96 was 57 to 43. However, this pattern was not repeated within occupational categories identified. Males tended to dominate amongst the conceptual and technical symbolic analysts, advanced-skill routine production workers and blue-collar routine production workers. Females, on the other hand, were numerically much more significant amongst professional in-person service workers, elementary in-person service workers and white-collar routine production workers. In the remaining categories the balance was similar to that in the population of all employed persons.

What the figures clearly re-emphasise is that, whilst on an overall basis females are close to being proportionally represented among all employed in the labour force, there are very few broad occupational areas where there is anything close to a fifty-fifty split of employment with males. Women and men were, by the mid-1990s, operating in albeit overlapping but still largely segmented labour markets. See also Anker (1997).

Whilst females were not well represented in the vital areas of symbolic analytic services, they were less exposed than males in the vulnerable routine production occupations. Twenty-three percent of males were employed as symbolic analysts of one sort or another compared to only ten percent of females. In contrast, only forty percent of females were in routine production occupations compared to fifty-four percent of males. In occupations less directly subject to the impact of globalisation, male workers were proportionately less than half that of females. Fifty percent of females were working in in-person service occupations compared to only twenty-three percent of males.

The contrast can also be made between males and females in terms of their representation in occupations classified by skill level. Almost half the males employed in 1995/96 were in the three high-level skill categories, compared to just over one quarter of female workers. On the other hand, only one quarter of males employed were in the low-skill occupations, whilst almost forty percent of females found work in those occupations.

These patterns are, however, changing rapidly. In the next section we analyse the data for these occupational categories for the decade from 1986/87 to 1995/96 to identify the emerging trends.

Before we do, however, it is useful here to compare the composition of the labourforce as revealed by the application of our nine-way classification of occupations, with that provided by the standard ASCO classification of major occupations. Table 5 can be contrasted with Table 4.

Table 5 Employment by ASCO major occupational categories, by sex, 1995/96

	Major ASCO categories								
	Managers	Professionals	Para-Professionals	Tradespersons	Clerks	Salespersons	Plant & Mach. Operators	Labourers	All
	Employed ('000)								
Male	662	661	244	1068	291	488	506	795	4716
Females	216	511	231	125	1068	909	73	437	3571
Persons	879	1172	476	1194	1359	1396	579	1232	8287
	Occupational group's share of employment (percent)								
Male	14	14	5	23	6	10	11	17	100
Female	6	14	6	4	30	25	2	12	100
Persons	11	14	6	14	16	17	7	15	100
	Gender share of employment (percent)								
Male	75	56	51	89	21	35	87	65	57
Female	25	44	49	11	79	65	13	35	43

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4.2 Growth in employment 1986/87 to 1995/96

The employment in the Australian labour force grew by eighteen percent between 1986/87 and 1995/96, at an average annual rate of 1.4 percent. However, as Figure 1 shows, the growth was not constant over the period. The recession of the late 'eighties and early 'nineties saw employment levels drop. Prior to that, employment was growing at an estimated annual rate of around 3.7 percent, and after the recovery it climbed back to around three percent per annum. Figure 1 also shows that the recession affected employment more amongst males than amongst females. Whilst the former suffered decline during that period, the latter, whilst it slowed, did not actually fall in any year.

Over the decade male employment grew at a slower rate than female employment. Whilst male employment grew only by a modest eleven percent (0.7 percent per annum on average) female employment grew by an impressive 28 percent (2.4 percent per annum).

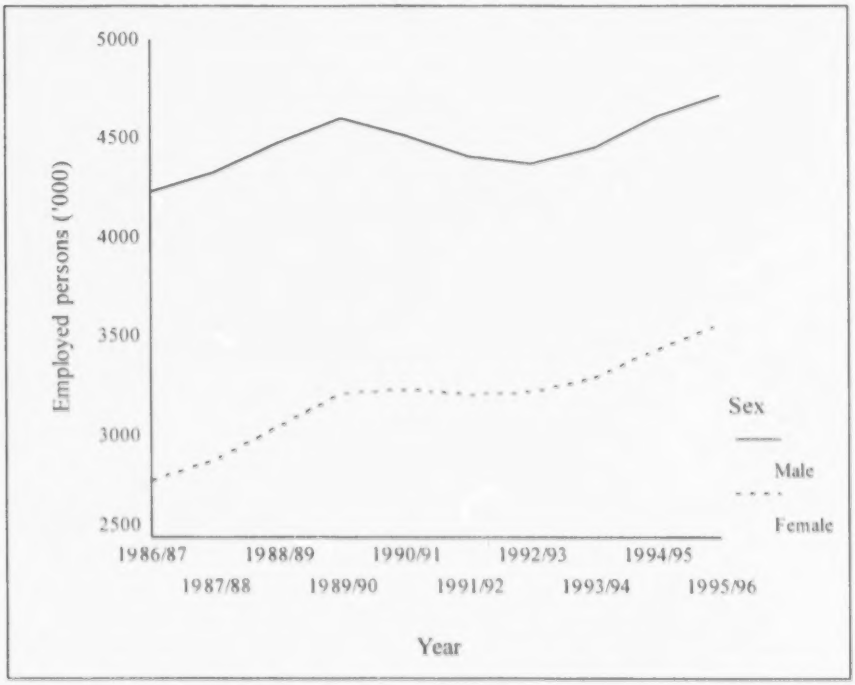

Figure 1 Employed persons by sex, 1986/87 to 1995/96 (Source: ABS Labour Force Surveys, Cat. 6203.0 (unpublished))

There are, of course, many factors that can account for these differences. One is simply statistical – female employment growth was off a lower base than that for males. But even allowing for that, significant social, educational and economic changes were at work that substantially altered female workforce participation over the period. Many more women entered and stayed longer in the workforce. Education participation and retention rates for women rose rapidly. Marriage and fertility patterns changed, and two-income family units proliferated. What we are interested in, however, is the changing occupational patterns that accompanied these trends.

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Table 6 sets out the average annual growth rates in each of the nine occupational categories over the period. Looking at the overall changes, a very clear pattern of divergent growth is evident. All three in-person service categories of occupations grew at well above the average, as did the conceptual symbolic analyst category. Whilst it is encouraging to see the latter group growing relatively strongly, what is not so good for Australia's economic future is that the strongest growth of all was posted by elementary in-person services. This category of occupations has been useful in picking up a large part of the increase in employment in Australia, however, in terms of an indicator of the country's competitiveness in the global economy it is not a good pointer to the future.

On the other side of the ledger, the remaining five categories of occupations experienced either sluggish growth, or negative growth, as in the case of advanced-skill routine production white-collar routine production. The latter demonstrates clearly the impact that technological and organisational changes have had on these occupations. The other categories in stagnation or decline reflect not only the impact of technological change, but also the 'exporting' of many of the jobs they contain as part of the impact of globalisation. As these categories include most of our advanced and middle level trade and technician occupations, this trend must be viewed with some concern.

The patterns evident amongst male and female employment are quite different. In all but one category (blue-collar routine production work) female employment growth rates clearly outstripped male employment growth rates. For males, the major growth area (at almost twice the rate as any other) was amongst elementary in-person service workers. Two other categories of occupations also grew at over twice the average rate – intermediate in-person service jobs and those for conceptual symbolic analysts. Professional in-person service jobs for males also grew, although at less than one per cent per annum, but in the rest, male employment either stagnated or declined.

In contrast, female employment grew most strongly amongst both conceptual and technical symbolic analysts, (the latter, albeit, off a very low base). All skill levels of in-person service worker occupations also experienced strong female employment growth over the period. Only amongst routine production worker categories was female job growth sluggish.

Table 7 provides the contrasting growth patterns in employment using the standard ASCO classification of major occupational groups. As with Table 5, the problems associated with using the conventional occupational classification system to identify the likely impact of globalisation and its attendant technological and organisational changes upon employment patterns, can be seen. Whilst it picks up some of the changes that have occurred over the period, many of the crucial changes that have taken place since the mid 'eighties have been masked.

The relative growth paths of male and female employment in each of the proposed new categories of occupations over the ten-year period can be seen in Figure 2. In all instances except amongst advanced-skill routine production workers, female employment maintained a relative growth level above that of males over the period. In some occupation categories there is evidence of a cyclical effect on relative growth paths, whilst in others the trends remain fairly constant throughout.

Table 6 Annual percentage growth rate* in employment by sex between 1986/87 and 1995/96

Occupational category	Male	Female	All
1. Symbolic analytic services (conceptual)	1.7	4.9	2.4
2. Symbolic analytic services (technical)	-0.8	5.6	0.1
3. In-person services (professional)	0.9	2.8	2.1
4. In-person services (intermediate)	1.8	3.0	2.3
5. In-person services (elementary)	3.3	4.0	3.7
6. Routine production services (advanced-skill)	-0.2	0.4	-0.1
7. Routine production services (white-collar)	-1.9	0.4	-0.2
8. Routine production services (blue-collar)	0.4	0.2	0.4
9. Routine production services (low-skill)	0.4	1.2	0.7
All	0.7	2.4	1.4

* OLS estimates

Table 7 Annual percentage growth rate* in employment by sex between 1986/87 and 1995/96, using ASCO categories of occupations

Occupational category	Male	Female	All
1. Managers & administrators	1.0	2.4	1.4
2. Professionals	2.2	4.6	3.2
3. Para-professionals	-0.2	2.5	1.0
4. Tradespersons	-0.1	1.2	0.0
5. Clerks	-0.9	1.3	0.8
6. Salespersons & personal service workers	3.1	3.9	3.6
7. Plant & machine operators & drivers	0.3	-2.8	-0.2
8. Labourers & related workers	0.4	1.1	0.6
All	0.7	2.4	1.4

* OLS estimates

Male **Female**

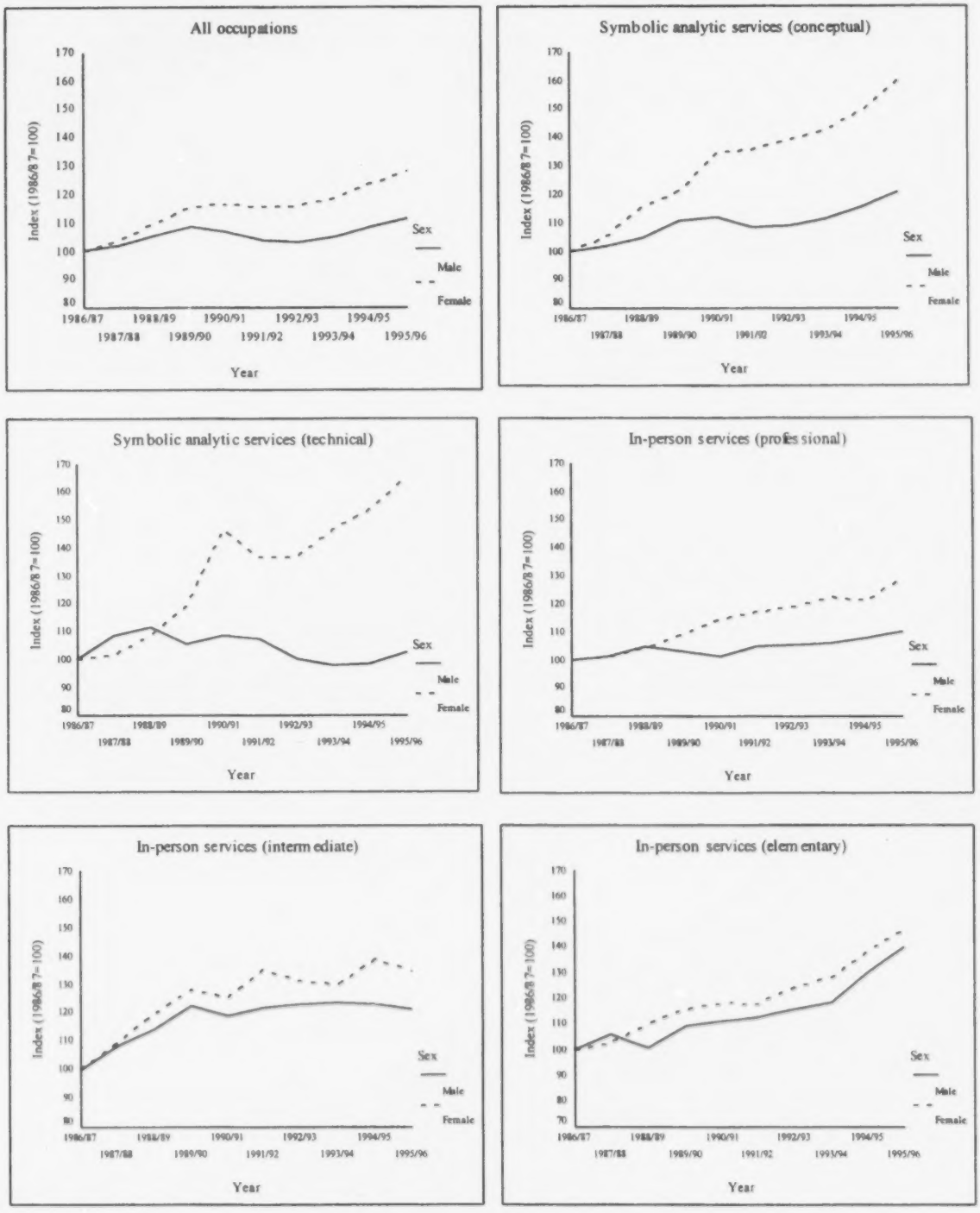

Figure 2 Relative employment growth in the nine occupational categories by sex, 1986/87 to 1995/96 (Source: ABS Labour Force Surveys, Cat. 6203.0 (unpublished))

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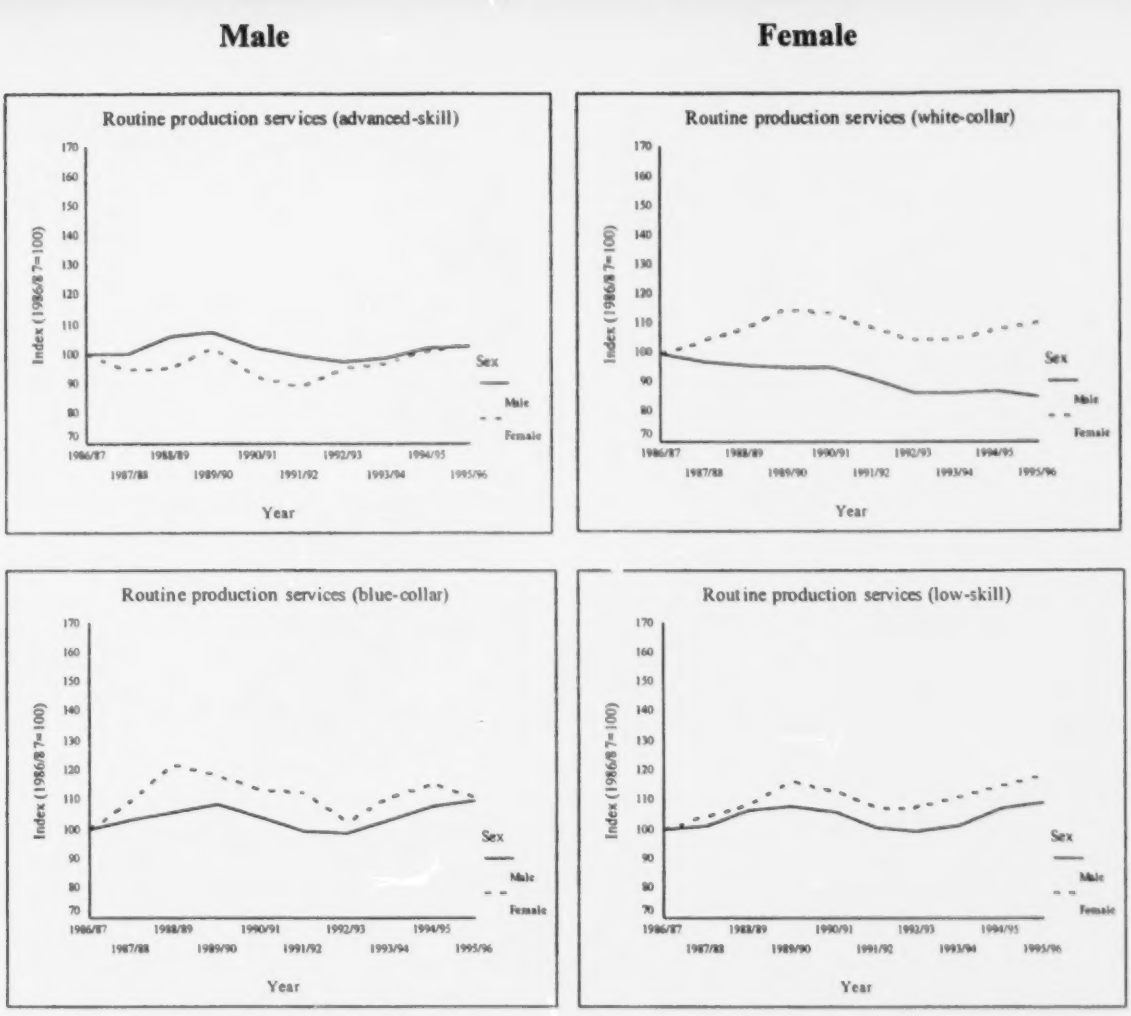

Figure 2 (contd.) Relative employment growth in the nine occupational categories by sex, 1986/87 to 1995/96 (Source: ABS Labour Force Surveys, Cat. 6203.0 (unpublished))

Figure 3 traces the impact these different growth patterns amongst occupational categories has had on the composition of the employed in the Australian labour force over the ten year period. Notwithstanding the different scales used in each graph, there are a number of interesting comparisons that can be made. Firstly, with the exception of the technical symbolic analyst category, the compositional changes for male and female employment have been, by and large, in the same direction. Secondly, there appear to be some categories of occupations whose relative shares in total employment are more subject to cyclical variations than are others. Curiously, the categories most prone to this – professional in-person service workers, and blue-collar routine production workers – operate in quite unrelated segments of the labour market. Thirdly, it is evident from Figure 3 that there was a profound shift in composition of both the male and female employment over the decade.

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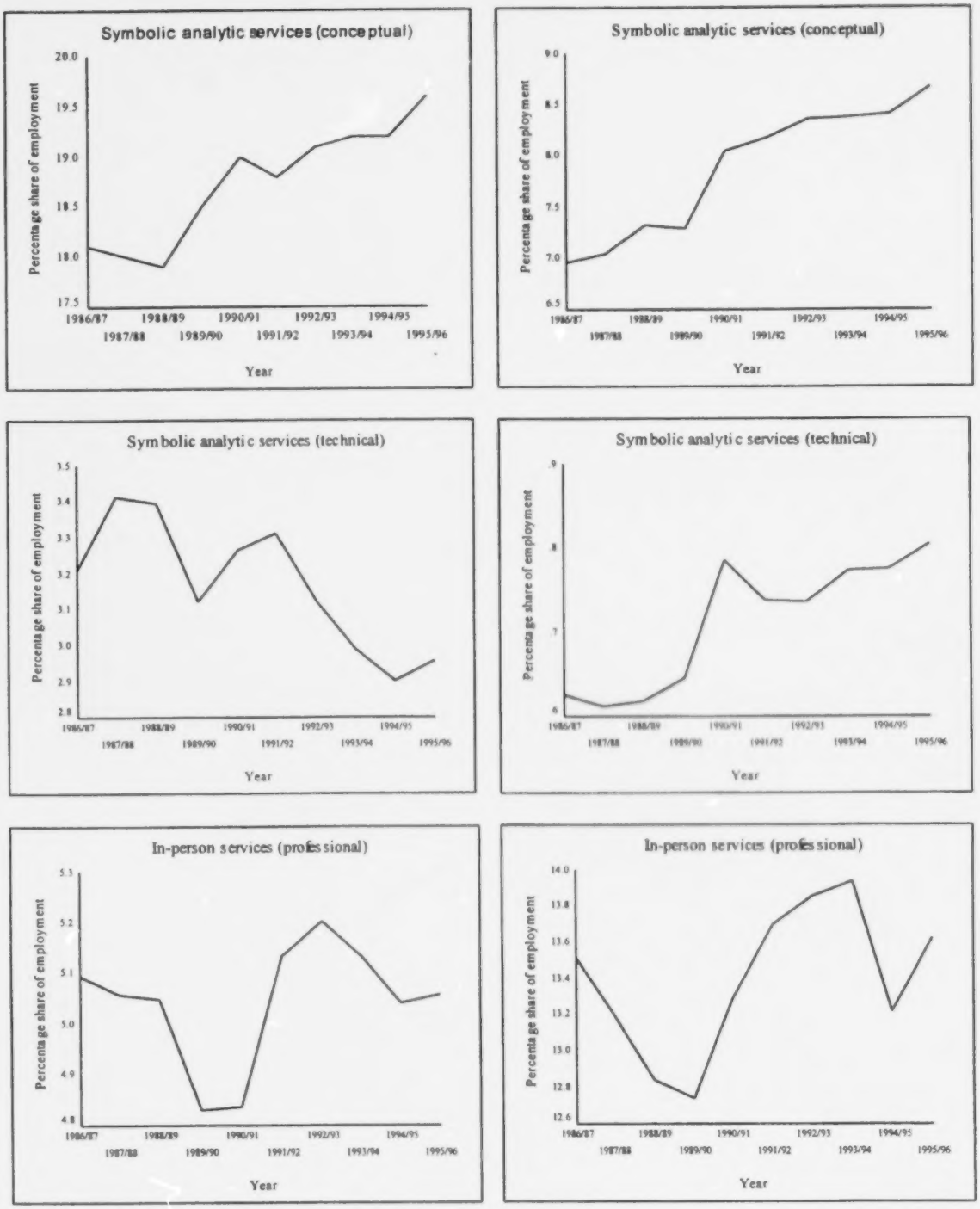

Figure 3 Share of employment in the nine occupational categories by sex, 1986/87 to 1995/96 (Source: ABS Labour Force Surveys (unpublished))

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Male **Female**

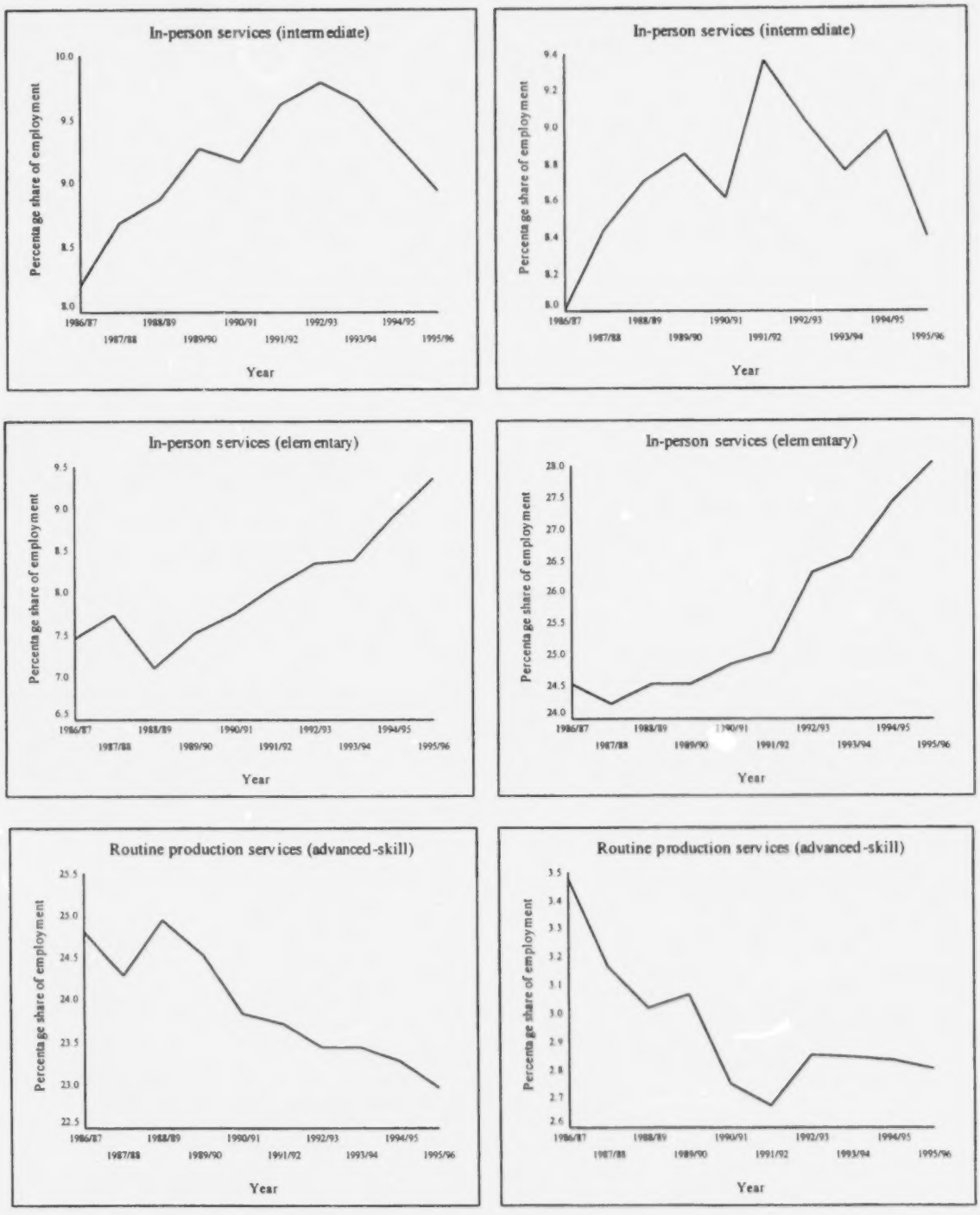

Figure 3 (contd.) Share of employment in the nine occupational categories by sex, 1986/87 to 1995/96 (Source: ABS Labour Force Surveys, Cat. 6203.0 (unpublished))

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Male **Female**

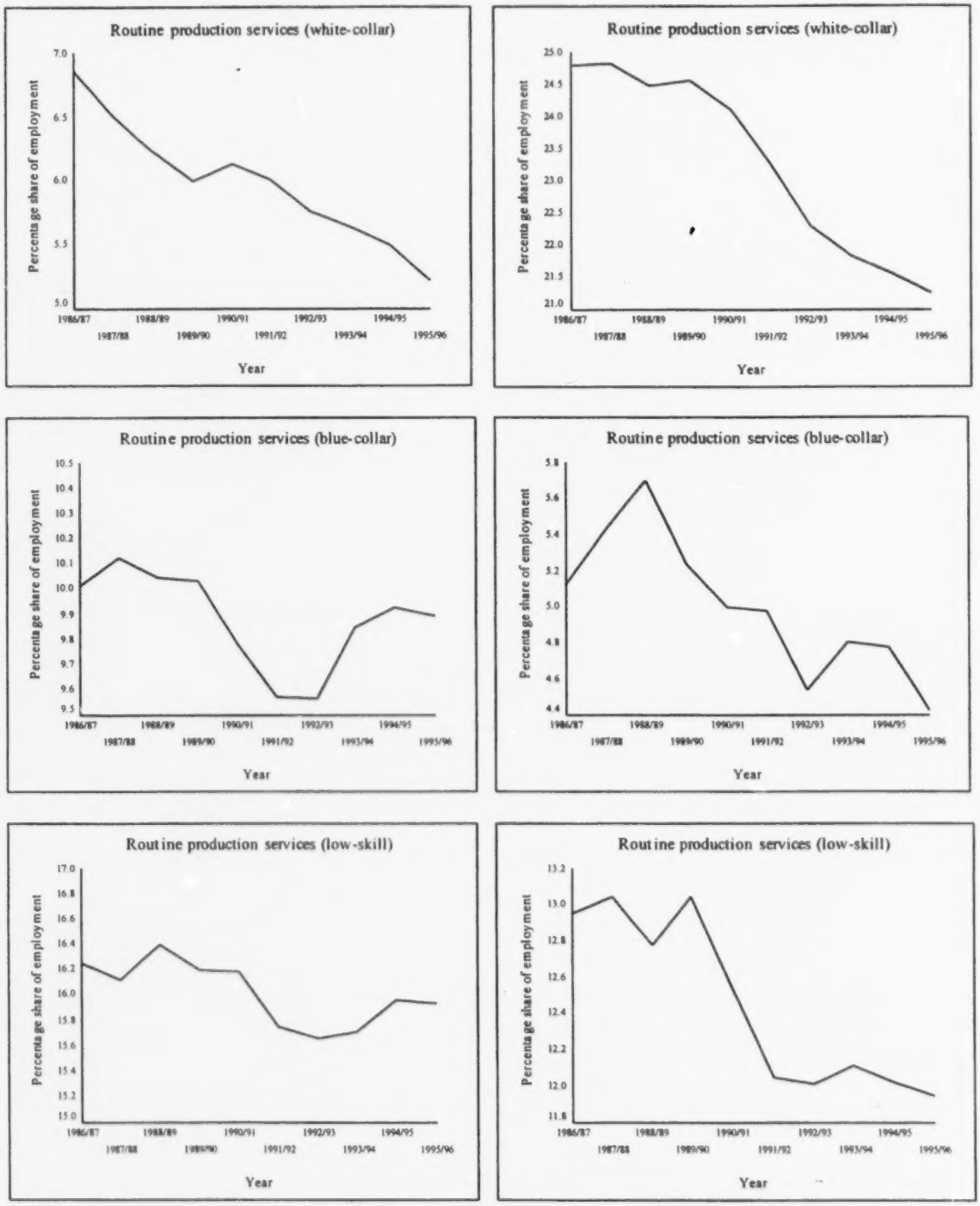

Figure 3 (contd.) Share of employment in the nine occupational categories by sex, 1986/87 to 1995/96 (Source: ABS Labour Force Surveys (unpublished))

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Overall there has been a marked shift away from the routine production categories at all skill levels. In particular, this shift is quite marked at the advanced-skill and in the white-collar category. There is an equally marked shift on the one hand, towards the conceptual symbolic analyst category and, on the other, towards the elementary in-person service category. What this amounts to is that there has been a clear trend away from the traditional core white and blue-collar occupations towards those that either require high level conceptual symbolic analytical skills, or that require very little in the way of skills and training. We will take up this point again below.

4.3 Hours worked

Occupational employment patterns within the total labour force do not reveal significant differences in the types of work being performed. They do not, for example, reveal whether the jobs being performed are full-time career jobs, permanent part-time jobs, or jobs that are more 'precarious', of a temporary, casual or short-term fixed contract variety. It is just as important to know how these underlying patterns are changing in the face of globalisation and rapid organisational and technological changes.

The Australian Bureau of Statistics collects data on the number of hours worked in a week in its quarterly surveys of the labour market, and these can be used to throw some light on what is happening to the nature of labour force attachment. The conventional dichotomy drawn is between full-time and part-time employment, where the former is generally taken as anything that involves more than 35 hours per week, and the latter as anything that adds up to less than that.

Table 8 shows the proportion of males and females in employment in the nine occupational categories that were working full time in 1995/96, compared to the percentage similarly employed in 1986/87. A number of points can be made from the figures in this table. One is that across all categories over this period the proportion of males working full-time was consistently higher than that for females. Second, the variation in that proportion between occupations was lower for males then it was for females, twenty percentage points compared to thirty. The third point is that, overall and in most occupational categories, the proportion in full-time work remained relatively constant, for both males and females.

There were, however, a number of significant shifts. For males working in the two lowest skill level occupational groups there was a pronounced shift towards part-time employment, while amongst technical symbolic analysts the shift was in the opposite direction. In female employment there was a similar, but less pronounced, trend towards part-time work in the elementary in-person service category, but a decidedly opposite trend amongst the conceptual symbolic analysts. As with male technical symbolic analysts, the small numbers of female technical symbolic analysts make the changes in this category difficult to interpret.

Table 8 Full-time as a percentage of total employment in the nine job categories, by sex, 1986/87 and 1995/96

Occupational category	Male		Female	
	1986/87	1995/96	1986/87	1995/96
1. Symbolic analytic services (conceptual)	89	88	63	68
2. Symbolic analytic services (technical)	79	83	66	63
3. In-person services (professional)	83	82	58	58
4. In-person services (intermediate)	90	89	62	62
5. In-person services (elementary)	73	65	42	38
6. Routine production services (advanced-skill)	82	84	59	58
7. Routine production services (white-collar)	81	82	55	55
8. Routine production services (blue-collar)	82	82	65	62
9. Routine production services (low-skill)	71	67	37	36
All	81	80	52	51

Note 1: Employed persons who reported having worked zero hours in the reference week of the survey have been excluded from the calculation in this table.

Note 2: The definition of a part-time worker is slightly different to the way the ABS (Cat. 6203) defines. Here it is defined as any worker who worked less than 35 hours in the reference week.

Source: ABS Labour Force Surveys, Cat. 6203.0 (unpublished).

The average annual rates of change in full-time and part-time employment over this period are given in Table 9. These underscore more clearly than Table 5 the quite marked shifts that have occurred in the patterns of labour market attachment. For both males and females growth in part-time employment was faster than that for full-time employment. For males, however, it grew at three times the rate whilst for females the difference was not nearly as pronounced.

By far the fastest growing type of employment for males over the period was in part-time elementary in-person service category. On the other hand part-time work in the advanced-skill and white-collar type routine production categories, and in that of technical symbolic analysts, declined. Full-time work across the categories was characterised by slow growth, stagnation or decline.

For females, the picture was much brighter, and the pattern clearer. Both full-time and part-time employment in both categories of symbolic analysis and in-person services grew strongly, whilst in all categories of routine production work, employment either stagnated or declined.

Table 9 Annual percentage growth rate in full-time and part-time employment by sex between 1986/87 and 1995/96

Occupational category	Male		Female	
	Part-time	Full-time	Part-time	Full-time
1. Symbolic analytic services (conceptual)	2.6	1.7	3.6	5.8
2. Symbolic analytic services (technical)	-2.7	-0.1	6.2	5.4
3. In-person services (professional)	1.4	0.9	2.9	2.8
4. In-person services (intermediate)	3.4	1.7	2.8	3.1
5. In-person services (elementary)	6.3	2.1	4.9	2.7
6. Routine production services (advanced-skill)	-1.2	0.2	0.7	-0.1
7. Routine production services (white-collar)	-2.7	-1.5	0.5	0.3
8. Routine production services (blue-collar)	1.4	0.3	-0.2	1.3
9. Routine production services (low-skill)	2.7	-0.5	1.7	0.6
All	1.7	0.6	2.8	2.0

Note 1: Employed persons who reported having worked zero hours in the reference week of the survey have been excluded from the calculation in this table.
Note 2: The definition of a part-time worker is slightly different to the way the ABS (Cat. 6203) defines. Here it is defined as any worker who worked less than 35 hours in the reference week.
Note 3: Rates are OLS estimates.

What an examination of employment by the numbers of hours worked per week shows, however, is that even distinguishing between part-time and full-time work conceals some significant shifts in the level of labour market attachment. A finer distinction reveals a substantial bifurcation in patterns.

Table 10 provides an indication of the distribution of hours worked per week across the nine occupational categories. It is convenient, for our purposes, to consider the lowest level of hours worked as being 'casual' work; the two middle ones as 'normal' range of working hours; and the highest level as 'long' hours of work. In so doing we can see that whilst roughly the same proportion of men and women worked in the normal range of hours in 1995/96, the latter were much more likely to have casual employment and the former to work long hours. For males, the occupations with the largest proportion working long hours (almost a half in both cases) were amongst conceptual symbolic analysts and intermediate in-person service workers, whilst the areas of greatest casual employment for males were in the two lowest level skill categories. The same pattern appears amongst female workers, but with a greater preponderance of casual work.

Table 10 Composition of employment by hours worked in the nine occupational categories, by sex, 1995/96 (percent)

Occupational category	Hours worked per week			
	1 to 15	16 to 34	35 to 48	49 and over
1. Symbolic analytic services (conceptual)				
Male	3	9	42	46
Female	12	20	45	24
2. Symbolic analytic services (technical)				
Male	2	15	60	23
Female	8	29	57	6
3. In-person services (professional)				
Male	6	12	45	37
Female	13	29	44	13
4. In-person services (intermediate)				
Male	3	8	43	46
Female	11	27	42	20
5. In-person services (elementary)				
Male	17	18	43	22
Female	29	33	32	6
6. Routine production services (advanced-skill)				
Male	3	13	59	24
Female	15	27	43	15
7. Routine production services (white-collar)				
Male	4	14	65	17
Female	19	26	49	6
8. Routine production services (blue-collar)				
Male	4	14	54	28
Female	10	28	56	6
9. Routine production services (low-skill)				
Male	15	18	52	15
Female	31	33	31	5
All				
Male	6	13	51	29
Female	20	29	41	10

Note 1: Employed persons who reported having worked zero hours in the reference week of the survey have been excluded from the calculation in this table.

Source: ABS Labour Force Surveys, Cat. 6203.0 (unpublished).

Another way of looking at the differences in hours worked by males and females in the different occupational categories is through comparing the extent to which each category is either under or over-represented amongst the total number of workers working the same hours per week in the whole labour force. In Figure 4, the Kaufman-Spilerman index[1] is used for this purpose. Over represented occupations lie above the line, those under-represented below it, and those where there is more or less proportional representation are on or about the line.

Figure 4 quite clearly shows the patterns that emerged in Table 9. Longer hours of work are typically associated with conceptual symbolic analysts, with in-person service workers at the intermediate-skill level and, to a lesser extent, with professional in-person service workers. On the other hand casual attachment to the labour force is much more prevalent amongst the two lowest skill level occupational categories.

If we turn now to how these patterns of labour force attachment have been changing over time we find some quite striking trends emerging. Figure 5 reveals that, most pronounced amongst male workers in all occupational categories, and amongst females employed as routine production workers, is the tendency for those in full-time employment to be working longer hours and for those in part-time work to be working shorter hours. Growth in employment across the normal range of hours worked has, in most cases, not kept pace with the tendency either for overwork or casualisation of employment.

4.4 Age distribution

There has clearly been an ageing of employment in the Australian labour force over the last decade or so. In 1986/87 fifty percent of workers were below the age of 35, and twenty-five percent were 45 or older. Ten years later, however, those below 35 had dropped to 44 percent, whilst those in the older age group had risen to almost thirty percent. The shift was more pronounced amongst female workers than amongst males. In the younger age group the proportion of males dropped from 47 to 44 percent, whilst for females it fell from 54 to 47 percent. Amongst older workers, those 45 and above, it rose from 27 to 31 percent for males, and from 22 to 27 percent for females. The pattern, however, differed across occupational categories. Table 11 and Figure 6, the latter using the same Kaufman-Spilerman index as in Figure 4, provide a detailed comparison of these changes by occupation category over the period.

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[1] This simple index reveals how the distribution of employment in a job category by hours worked per week compares with that for the whole population in the following way:

$$I_{hj} = \frac{P_{hj}}{P_h},$$

where I_{hj} is the index for those employed h hours per week in job j, P_{hj} is the proportion of workers in job j employed for h hours per week and P_h is the proportion of all workers employed for h hours per week. It was used by Kaufman and Spilerman (1982) to study the age structures of occupations. If the above index is less than one then those working h hours per week in job j are under represented in the population of all who work h hours per week; if the index is greater than one then they are over represented. Separate indices are calculated for male and female populations in 1986/87 and 1995/96.

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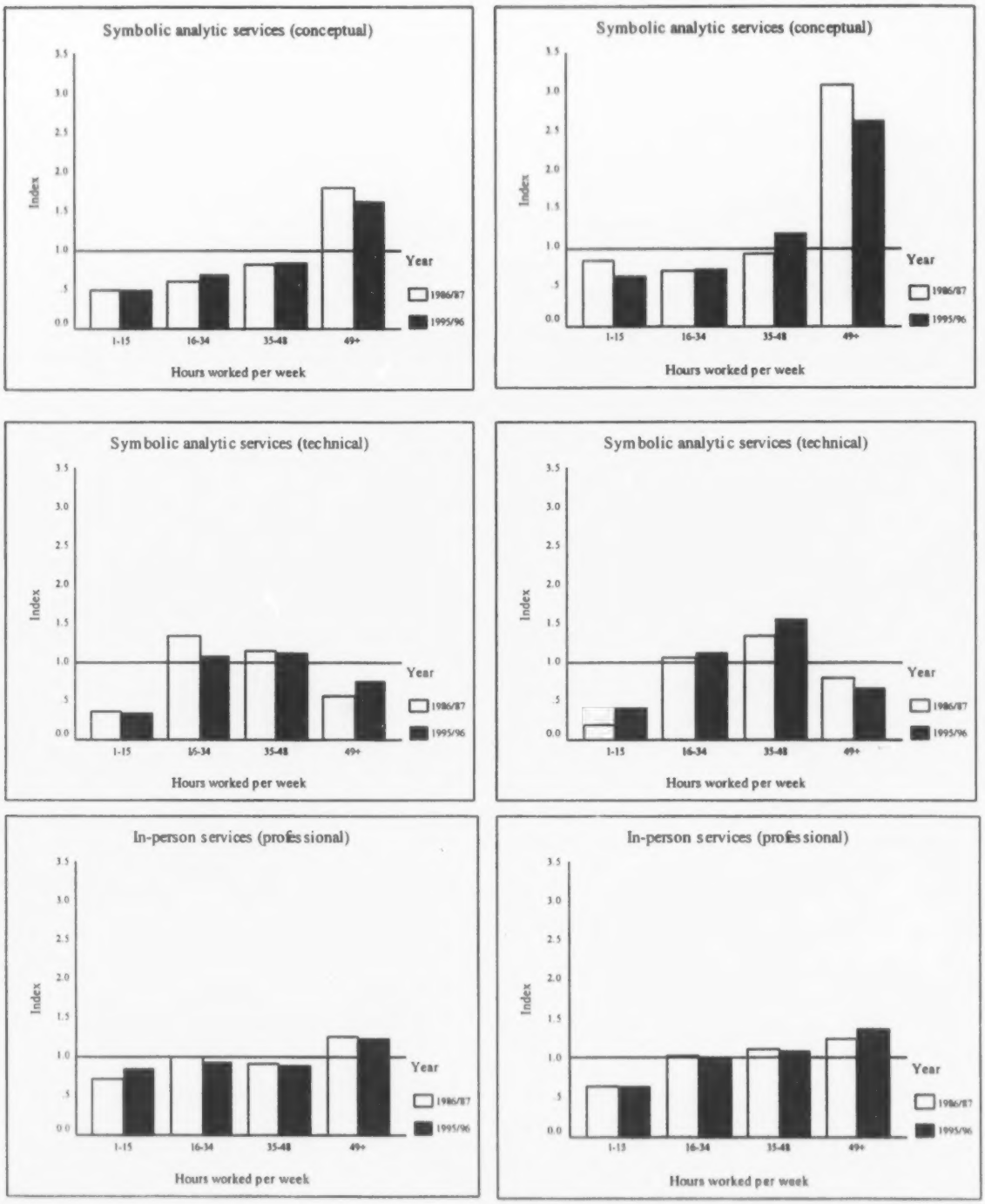

Figure 4 Employment by hours worked per week in the nine occupational categories relative to that for the whole labour force, by sex, 1986/87 and 1995/96 (Kaufman-Spilerman index)

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Male **Female**

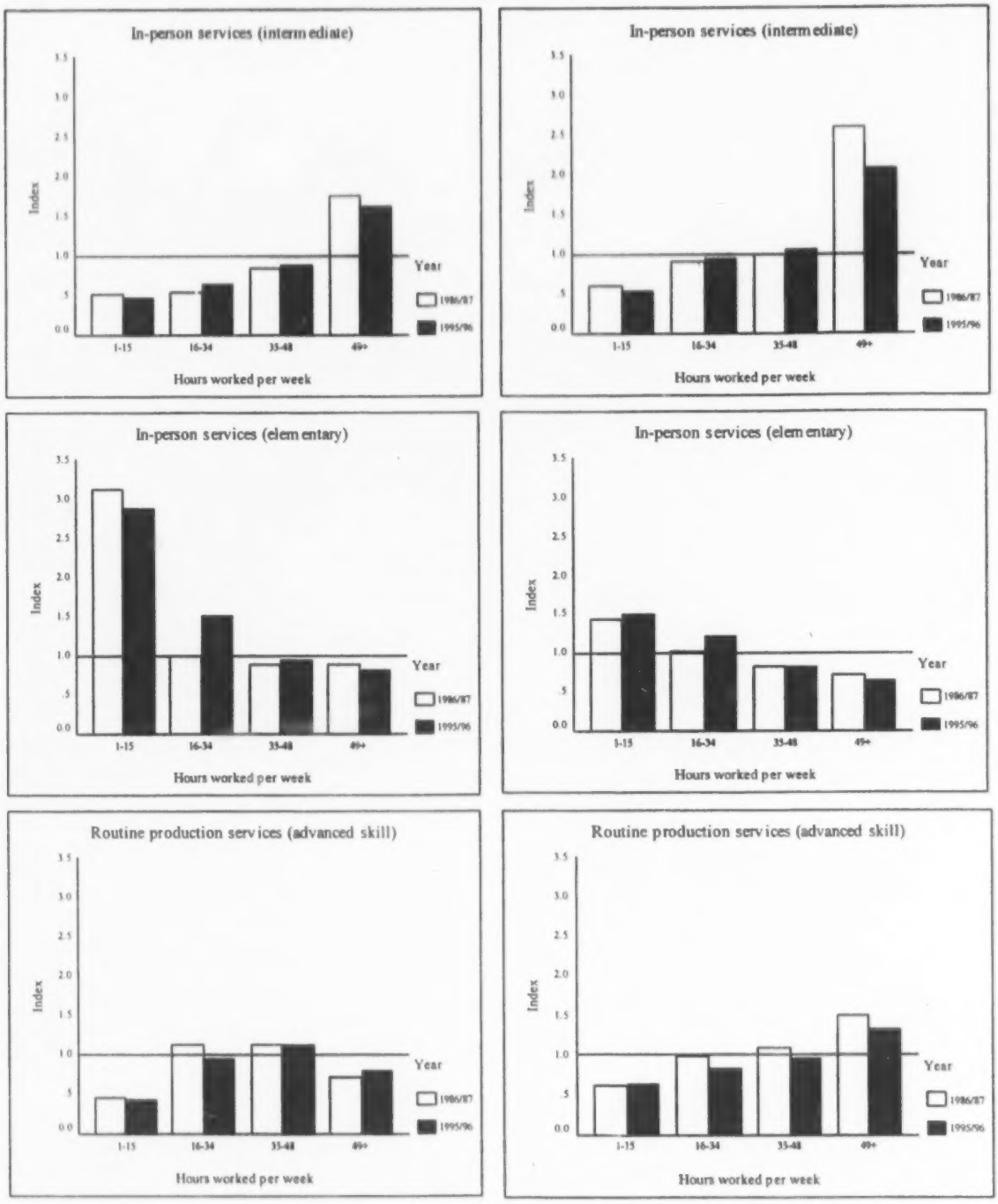

Figure 4 (contd) Employment by hours worked per week in the nine occupational categories relative to that for the whole labour force, by sex, 1986/87 and 1995/96 (Kaufman-Spilerman index)

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Male **Female**

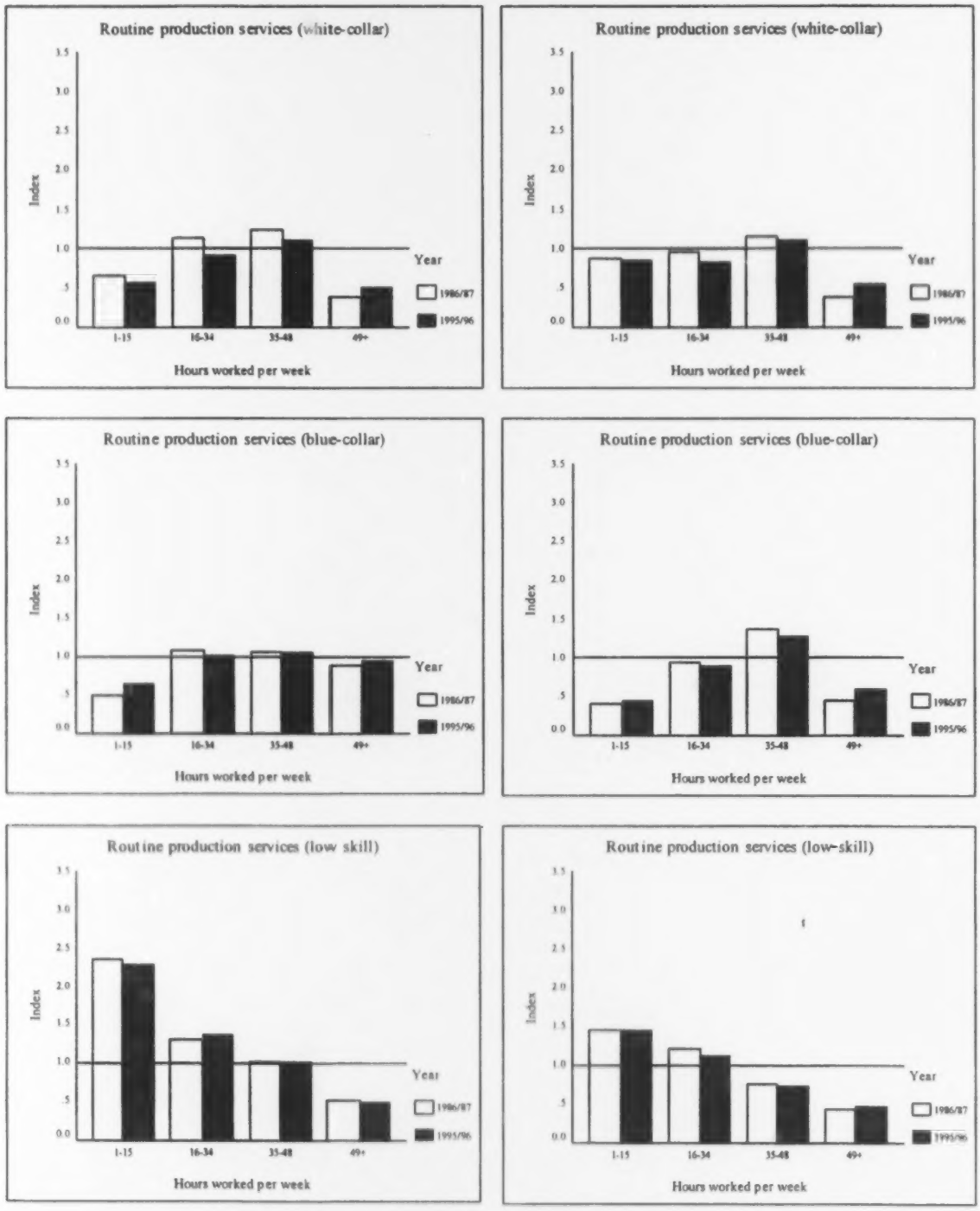

Figure 4 (contd.) Employment by hours worked per week in the nine occupational categories relative to that for the whole labour force, by sex, 1986/87 and 1995/96 (Kaufman-Spilerman index)

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Male **Female**

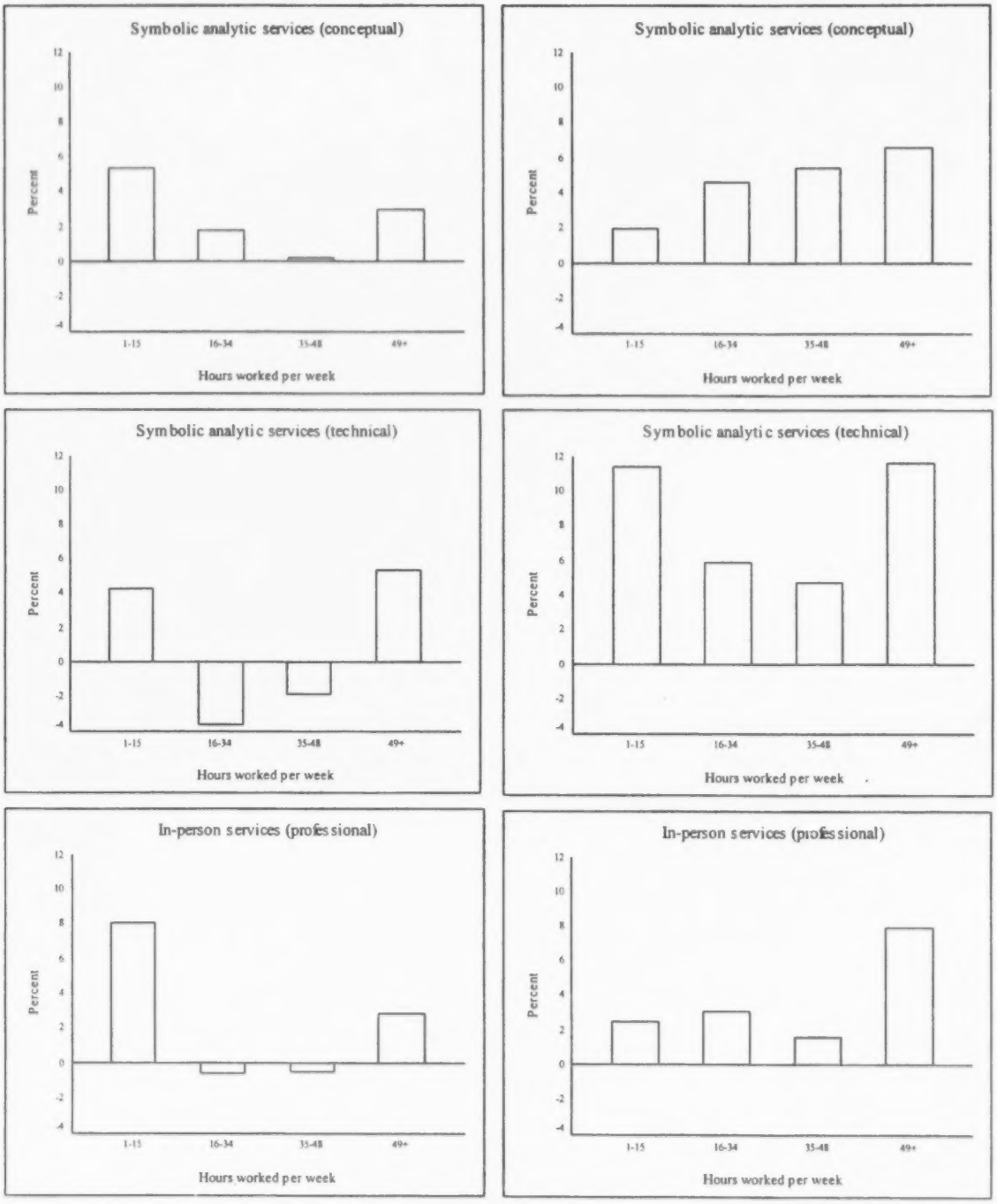

Figure 5 Annual growth rate in employment by hours worked per week and by sex, in the nine job categories between 1986/87 and 1995/96 (OLS estimates)

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Male **Female**

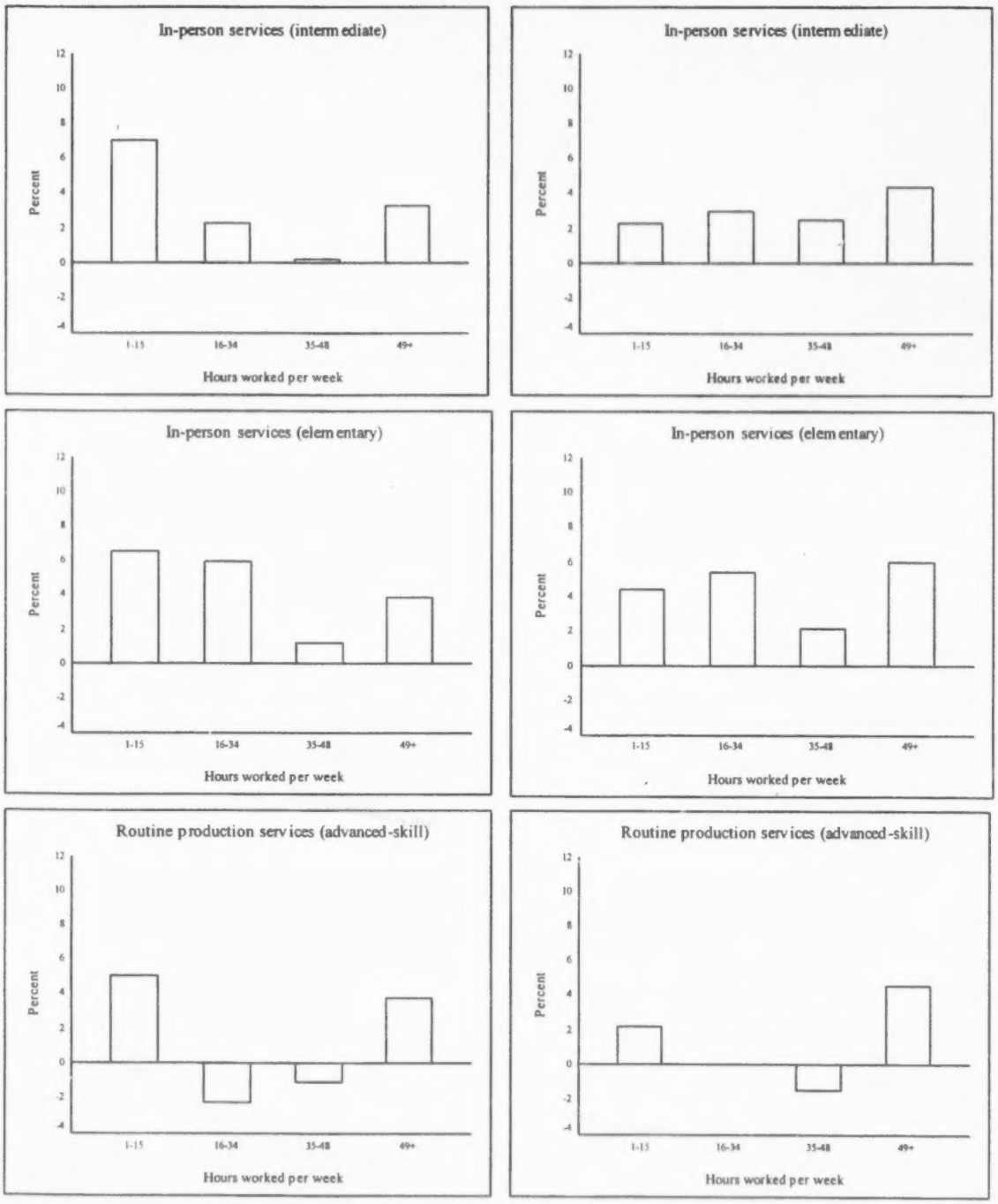

Figure 5 (contd) Annual growth rate in employment by hours worked per week and by sex, in the nine job categories between 1986/87 and 1995/96 (OLS estimates)

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Male **Female**

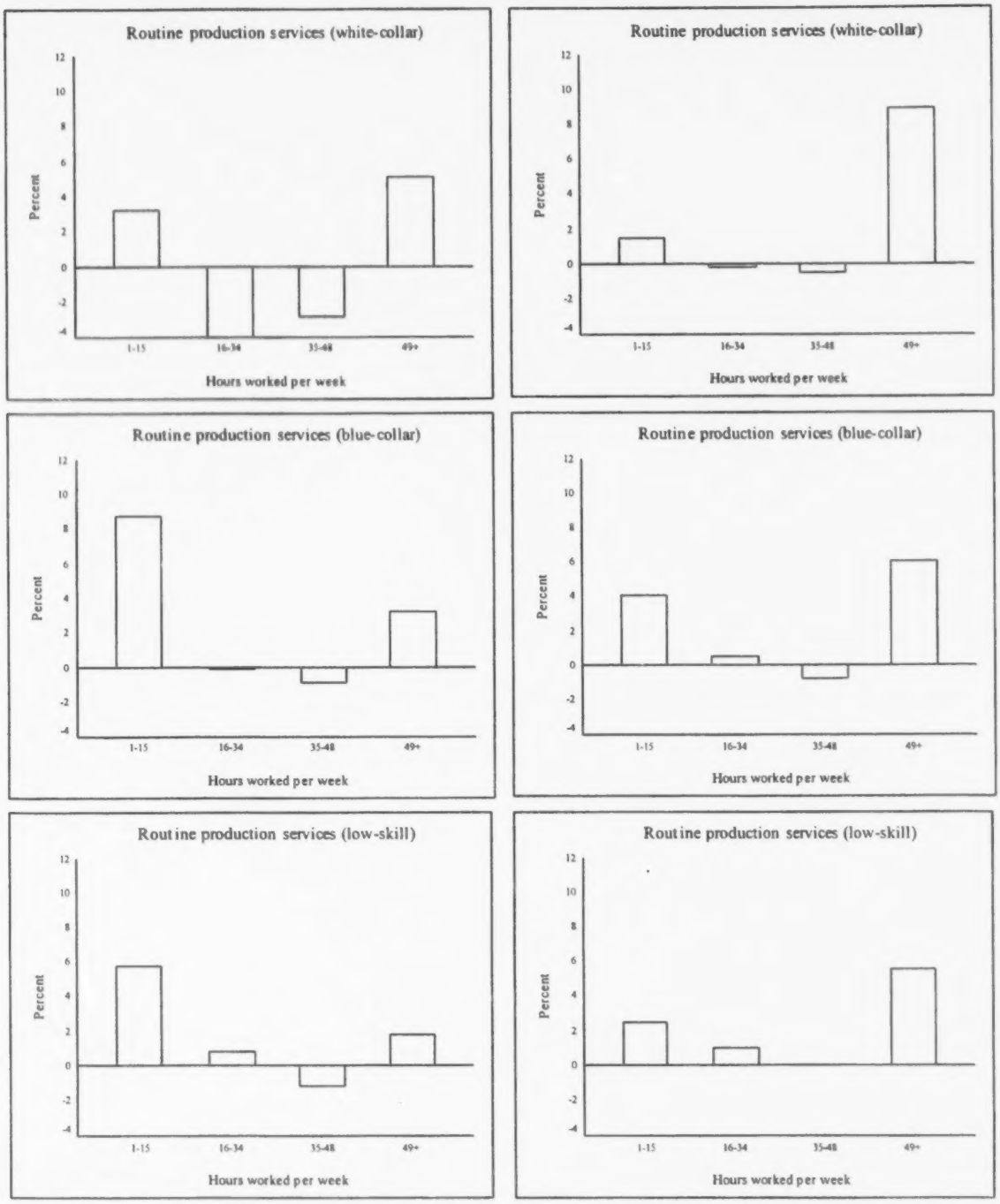

Figure 5 (contd) Annual growth rate in employment by hours worked per week and by sex, in the nine job categories between 1986/87 and 1995/96 (OLS estimates)

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Table 11 Age distribution of employed persons in the nine occupational categories by sex for 1986/87 and 1995/96

	Occupation category																			
	Symbolic analytic services				In-person services						Routine production services									
	Conceptual		Technical		Professional		Intermediate		Elementary		Advanced-skill		Intermediate (white-collar)		Intermediate (blue-collar)		Low-skill		All	
Age	1986	1995	1986	1995	1986	1995	1986	1995	1986	1995	1986	1995	1986	1995	1986	1995	1986	1995	1986	1995
										Male										
15-19	1	0	2	1	1	0	2	1	18	15	10	7	7	3	3	3	16	16	8	6
20-24	6	5	9	9	5	5	8	7	16	18	16	15	15	13	13	10	16	16	12	12
25-34	25	22	29	24	35	24	27	25	23	24	29	29	31	27	28	29	24	24	27	26
35-44	31	29	29	31	35	33	32	29	18	17	21	24	24	27	26	27	18	19	25	25
45-54	21	27	21	25	14	25	20	26	14	16	14	16	13	20	20	21	14	15	16	20
55-64	13	11	9	8	8	10	10	10	10	8	8	8	9	8	10	9	11	8	10	9
65+	4	4	0	1	2	3	2	2	1	2	1	1	1	1	0	1	1	1	1	2
										Female										
15-19	2	1	5	2	1	1	8	4	26	20	9	5	9	3	8	3	9	9	11	8
20-24	10	9	28	16	13	8	14	13	19	20	17	15	18	13	21	13	10	10	16	14
25-34	30	31	37	36	37	26	27	26	21	21	25	25	28	28	28	28	22	21	27	25
35-44	30	28	18	26	28	35	30	29	20	19	24	26	25	28	25	27	28	27	25	26
45-54	17	21	6	16	15	23	15	22	11	15	18	22	14	22	15	22	22	24	15	20
55-64	10	8	5	3	5	6	6	6	4	4	8	7	6	6	3	7	8	8	6	6
65+	3	2	0	0	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1
										Persons										
15-19	1	0	2	1	1	0	4	2	23	19	10	7	8	3	5	3	14	14	9	7
20-24	6	6	11	10	10	7	10	9	18	19	16	15	17	13	15	11	14	14	14	12
25-34	26	25	30	26	36	26	27	25	22	22	29	29	29	28	28	29	23	23	27	25
35-44	31	29	28	30	31	34	31	29	19	19	21	24	25	27	26	27	21	22	25	26
45-54	20	26	19	24	15	24	18	24	12	15	15	17	14	21	18	21	17	18	16	20
55-64	12	10	9	7	6	7	8	9	6	5	8	7	7	7	8	9	10	8	8	8
65+	4	4	0	1	1	1	1	2	1	1	1	1	1	1	0	1	1	1	1	1

Note: 1986 refers to financial 1986/87 and 1995 to financial year 1995/96.
Source: ABS Labour Force Surveys, Cat. 6203.0 (unpublished).

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Male **Female**

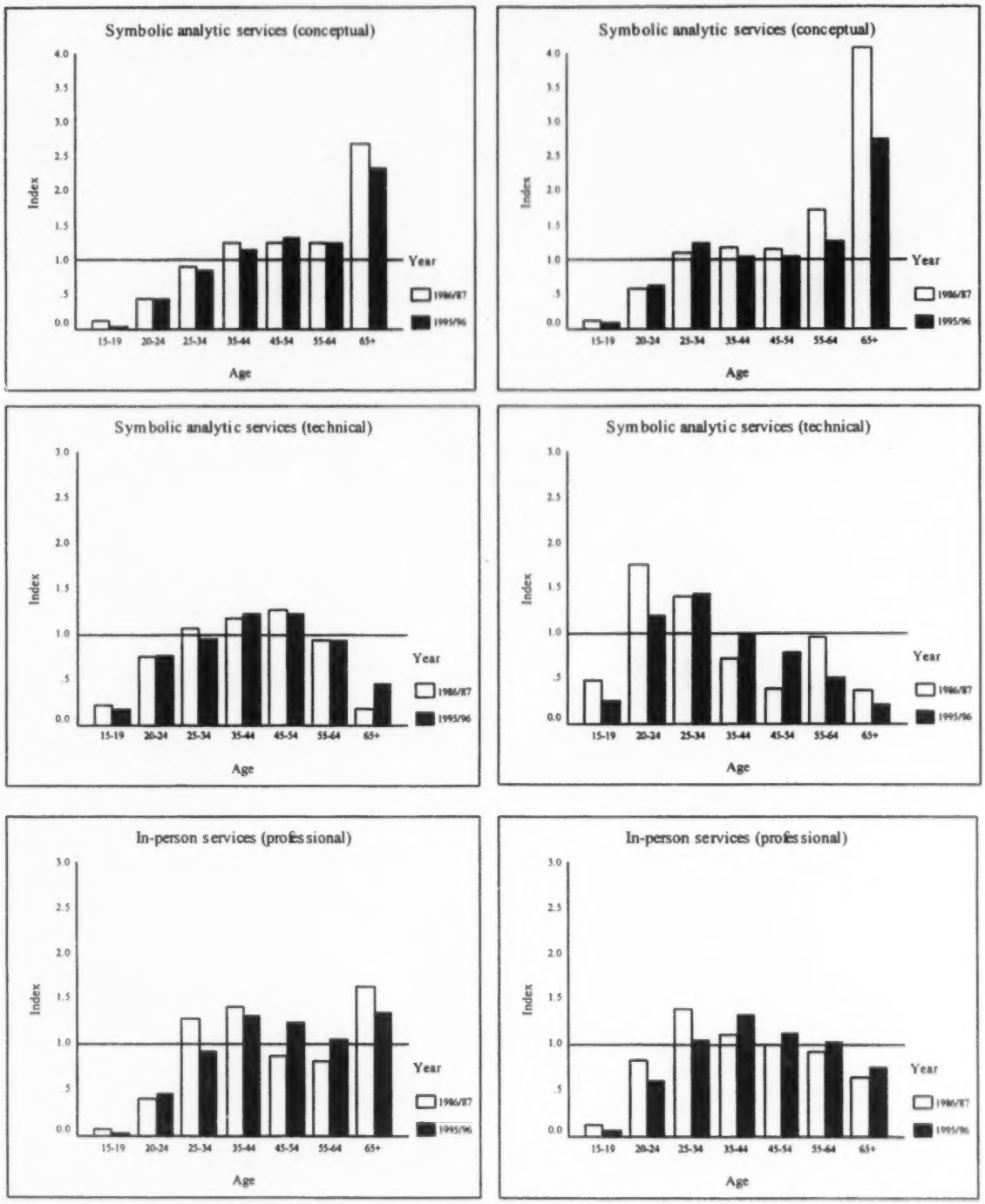

Figure 6 Relative age profile in the nine occupational categories relative to that for the total employed, by sex for 1986/87 and 1995/96 (Kaufman-Spilerman index)

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Male **Female**

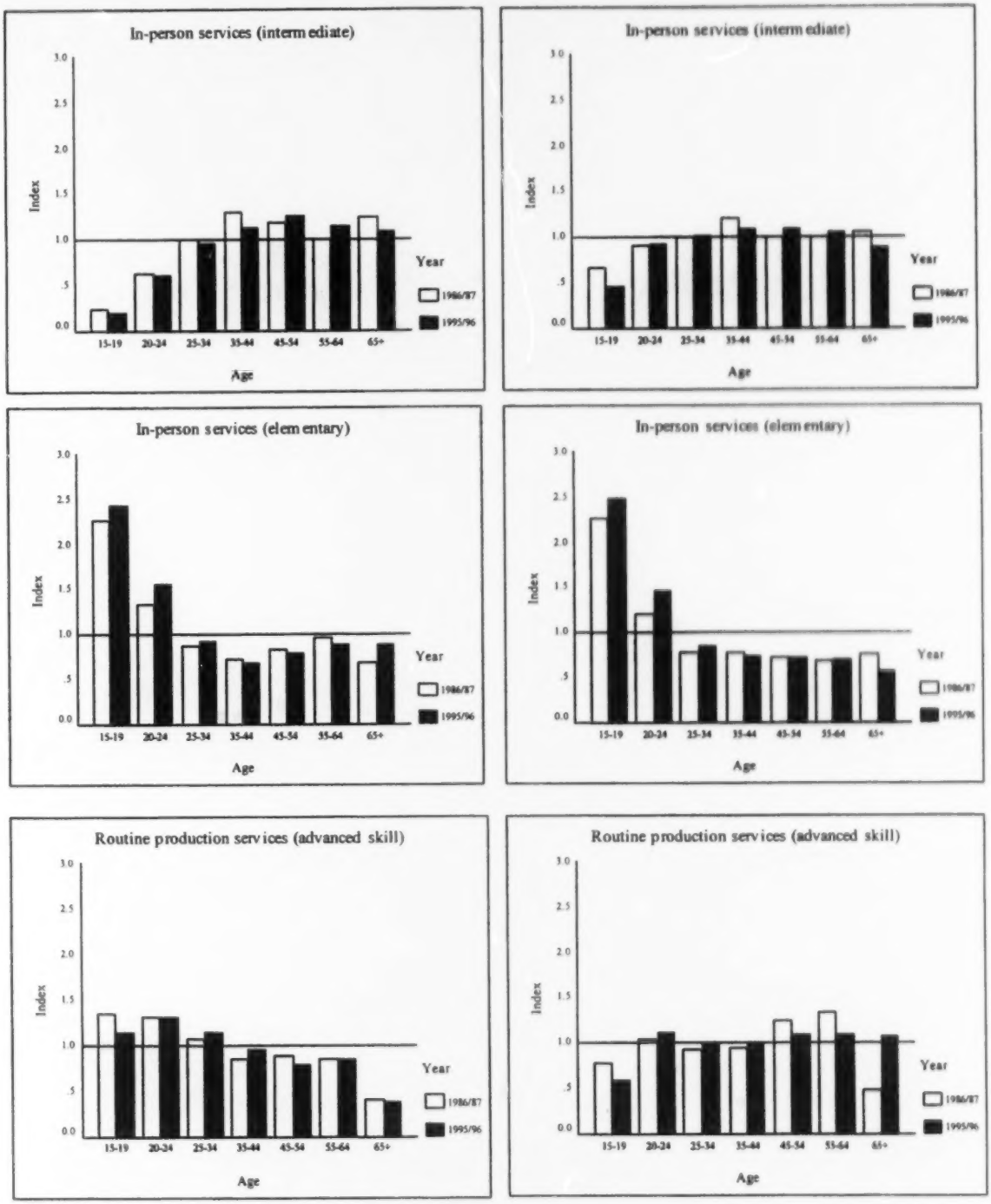

Figure 6 (contd.) Relative age profile in the nine occupational categories relative to that for the total employed, by sex for 1986/87 and 1995/96 (Kaufman-Spilerman index)

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Male **Female**

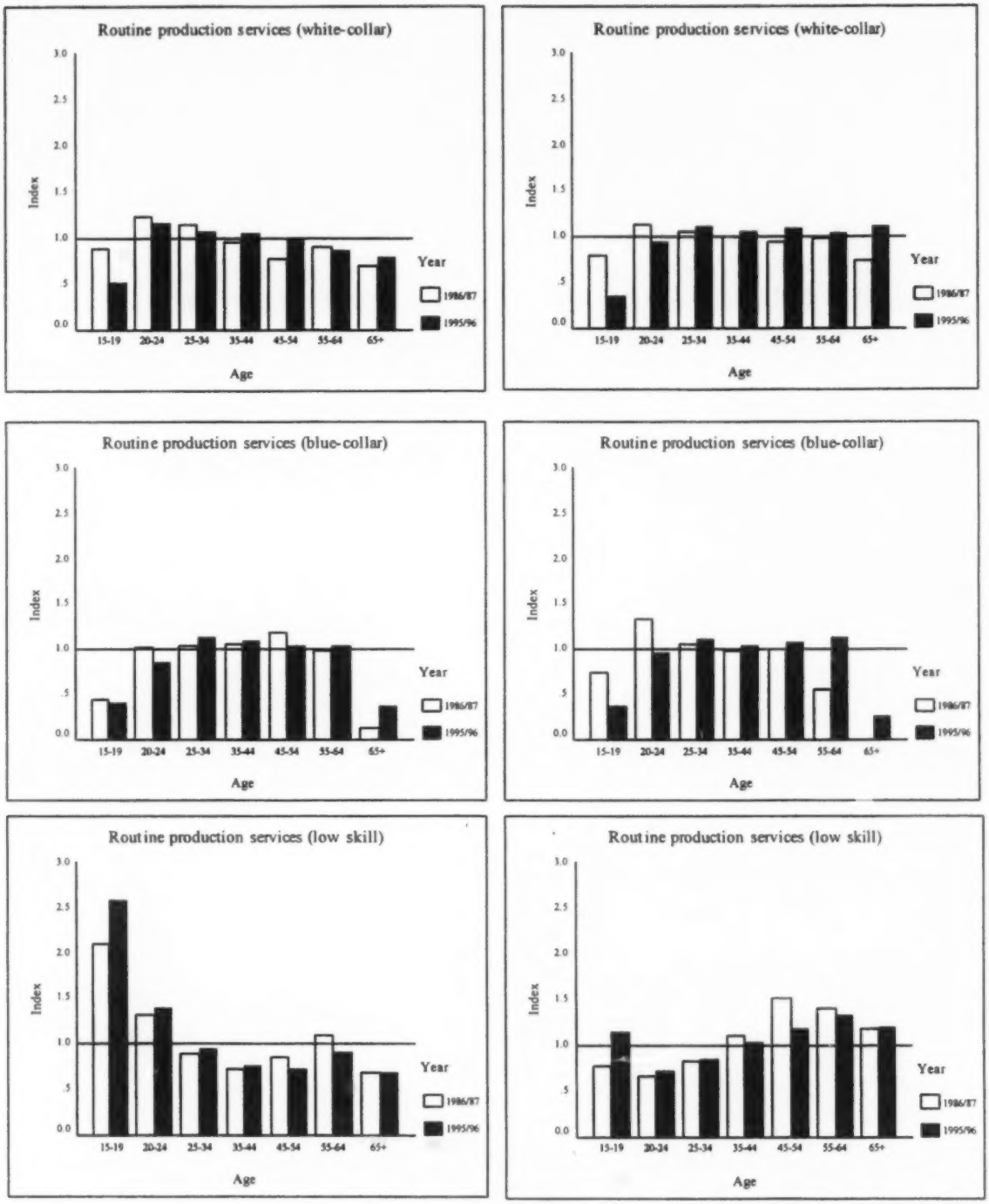

Figure 6 (contd.) Relative age profile in the nine occupational categories relative to that for the total employed, by sex for 1986/87 and 1995/96 (Kaufman-Spilerman index)

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What is not surprising is that young people, especially those below the age of twenty-five, are not well represented in the higher skill occupational categories, the only exception being males in the advanced skill routine production work category. Nor are they particularly well represented across the intermediate skill level occupational categories. The generally longer initial education and training periods account for that. They are, however, clearly over-represented in the lowest skill occupational categories. For those in the youngest age brackets in the labour force (for even those in full-time education and training) these often represent the only job categories open to them. The only exception to this is amongst low-skill routine production workers where young males are over-represented but young females are not.

In the higher skill occupational categories workers above the age of thirty-five tend to be much more proportionately represented. The relatively small numbers of workers in the highest age bracket (age 65 and over) are heavily concentrated amongst conceptual symbolic analysts.

5 Summary and Implications for Education and Training

We set ourselves the task of coming up with a classification of occupations that would clearly identify and highlight the shifting patterns of employment that have occurred over the last decade. This period coincides with the time when the Australian economy has been subject to the forces of globalisation, and to their attendant rapid technological changes and organisational restructuring. Moreover, we wanted a classification of occupations from which we could draw implications for the provision of education and training. To do that the classification had to be able to reveal the changes in both the level and type of skills that the emerging patterns of employment require.

The existing major occupational categories contained in ASCO (first edition) allow some of those effects to be discerned, but they also mask other significant ones. Ideally, what is required, is a bottom-up revamping of the entire occupational classification system along the lines we suggest. That would take account of the enormous changes that have been going on within and between the jobs people do, and of the entirely new roles and functions they perform, as a result of technological and organisational change. That task was clearly outside our brief and capacity. In any event it would not have served our purpose, since it could not have been applied retrospectively to the occupational statistics already collected. Instead we came up with a hybrid – a major reclassification of existing disaggregated occupational categories.

So what conclusions can we draw from our analysis? Is the reclassification useful, and what does it reveal? The answer to the former, of course, is provided by the answers to the latter.

There are four salient points to emerge from our analysis. The first is that, in broad terms, the impact on employment in Australia of globalisation of the world economy, and of Australia's increased exposure to it, and of the attendant rapid technological change and organisational restructuring, has been more negative than positive. Over the decade to 1995/96 overall employment growth was not particularly strong, particularly on a full-time basis. There was, of course, a significant recession during this period, but taking the period as a whole, employment growth was still slow by past experience. Within this slowly growing total however, all of the stagnation and decline in employment was in the occupational categories most vulnerable to globalisation, technological change and restructuring. On the other hand, only part of the growth, and not necessarily the fastest growing part, was in the occupational category best placed to take advantage of the opportunities these forces opened up. Much of the growth occurred, instead, in those occupational categories not directly open to global forces, and which do not directly add to the competitiveness of the Australian economy. Moreover, within these insulated in-person service occupations, the strongest growth of all has been at the lowest skill end of the employment spectrum, and mostly in casualised form.

The second point to note is that over the period there was a marked tendency to polarisation of attachment to the labour force. Whilst those in full-time employment were being called on to work much longer hours, those in part-time employment were being obliged to work shorter hours. Whilst this 'hollowing out' of the profile of working hours did vary to some extent between occupational categories, and was more pronounced amongst male workers, it was sufficiently general to suggest either that the impact of technological and organisational change was all-pervasive, or that some other factors were at work.

The third point is that within this somewhat gloomy picture, female workers, overall, have been the gainers. Female employment consistently outgrew that of males over the period. Whilst in many cases this was from a much lower base than that for males, female employment growth rates across the occupational spectrum were much higher than that for males.

The majority of female workers were still, at the end of the period, being employed in a limited number of occupations, typically at the intermediate and lower skill levels and in part-time employment. However, the trend over the period was for them to spread out into more highly skilled and full-time employment. Indeed, they appeared to be the ones responding faster to the growing demand for conceptual symbolic analysts.

Male employment, on the other hand, appeared to be in something of a crisis. Overall growth in employment has been sluggish. Moreover the occupations hardest hit by the forces of globalisation, technological and organisational changes are the ones that men have traditionally dominated. On the other hand, growth in employment in two other areas – as conceptual symbolic analysts and at the higher levels of in-person service – has been slower than it has been for females. Moreover, men are being forced (or were choosing) more and more to work on a part-time and casual basis. The fastest growing area of male employment over the decade was in casual elementary level in-person service work.

The final point concerns the implications of these emerging employment patterns on training and education. What must clearly be the next phase of this study is the examination of the changes in the educational background of workers in each of the nine occupational categories. In the meantime, however, the classification criteria we have employed allow us to make some comments about what are the principal sources of education and externally provided training for each occupational category, and then to suggest some broad emphases these providers should give to their programs.

Table 12 provides an approximate guide to the sources of education and externally provided training for each of the nine occupational categories. One of the primary roles of universities has been to prepare young people for entry into the professional in-person service occupations. For them to continue to do this effectively greater emphasis needs to be given to the range of interpersonal communication skills that are required for those occupations. But the universities are also the major source of our conceptual symbolic analysts, and it is for them to expand and improve their role in this capacity that will be crucial if Australia is to maintain and improve its international competitiveness. This not only means that nothing short of world best practice is good enough – for it is increasingly in international labour markets that its graduates must

effectively compete – but that these institutions must be flexible and adaptable to meet the continually changing requirements of the global environment.

Table 12 Highest levels of education and externally provided training for each of the nine occupational categories

Occupation category	Education and/or external training sector		
	Universities	TAFE/VET providers	Secondary schools
1. Symbolic analytic services (conceptual)	Major	Significant*	Negligible
2. Symbolic analytic services (technical)	Minor	Major	Negligible
3. In-person services (professional)	Major	Minor	Negligible
4. In-person services (intermediate)	Minor	Major	Negligible
5. In-person services (elementary)	Negligible	Major	Major
6. Routine production services (advanced-skill)	Negligible	Major	Negligible
7. Routine production services (white-collar)	Negligible	Major	Minor
8. Routine production services (blue-collar)	Negligible	Major	Negligible
9. Routine production services (low skill)	Negligible	Minor	Major

* For some occupations in this job category TAFE would be a major provider, for example, visual and performing arts, professional writing, farming, photography etc.

If universities need to improve their performance, the TAFE/VET sector has to radically reshape its role. Traditionally, this sector has provided the education and training in (mainly male oriented) technician and craft/trade skills, where intermediate and advanced level competencies have been emphasised. However, as our analysis has shown, many of the occupational categories into which these institutions have supplied workers are either stagnating or declining. Whilst this role nevertheless continues to be important, it is clearly incumbent upon the TAFE/VET sector to play a much more effective role than it has played before in preparing people both as in-person service workers and as conceptual symbolic analysts. For the former, high level interpersonal skills, not just technical competencies, should be given a major priority in course design and program development and delivery. As for the latter, the TAFE/VET sector is already a significant source of education and training for a range of conceptual symbolic analysts, especially in the creative arts, media, multimedia and information technology arenas. This is clearly a role to which these institutions must give a greater priority than they have done so far. In doing so, reliance solely on achieving competency standards is obviously insufficient and inappropriate. Again, world best practice, and international leadership in innovation should be the goal.

For both the universities and the TAFE/VET sector to meet the challenges of the changing patterns of employment there needs to be clearly defined pathways between sectors and the development of imaginative co-operative programs. But even more important than that, if Australia is to provide more than just expanding employment opportunities as casual elementary level in-person service workers to many of its young people, the cognitive and affective skills they acquire during their school years must also be of world best practice standard. The greatest challenge to our education and training system that emerges from this analysis is to the school system itself, for it is upon the base it provides that the competitiveness of Australia's future workers will depend.

We believe the proposed new occupational classification is a useful one.

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Appendix

Table A1 Occupations included in symbolic analytic services (conceptual) category

Occupation description	ASCO 4-digit code (first edition)
Parliamentarians, councillors and government representatives	1101
General managers	1201
Finance managers	1301
Sales and marketing managers	1303
Production managers	1305
Supply and distribution managers	1307
Personnel and industrial relations managers	1309
Data processing managers	1311
Public policy managers	1313
Education managers	1317
Commissioned officers (management)	1319
Other specialist managers	1399
Farmers and farm managers	1401
Managing supervisors (other business)	1601
Chemists	2101
Geologists and geophysicists	2103
Physicists	2105
Life scientists	2107
Medical testing professionals	2109
Other natural scientists	2199
Architects and landscape architects	2201
Quantity surveyors	2203
Cartographers and surveyors	2205
Chemical engineers	2207
Civil engineers	2209
Electrical and electronics engineers	2211
Mechanical engineers	2213
Mining engineers	2215
Metallurgists and materials scientists	2217
Other engineers	2219
University and cae teachers	2501
Accountants	2701
Public relations officers	2703
Personnel specialists	2705
Computing professionals	2707
Other business professionals	2799
Painters, sculptors and related professionals	2801
Photographers	2803
Designers and illustrators	2805
Journalists	2807
Authors and related professionals	2809
Film television and stage directors	2811
Dancers and choreographers	2813
Musicians composers and related professionals	2815
Actors and related professionals	2817
Announcers	2819
Economists	2901
Education researchers and related professionals	2905
Other social scientists	2907
Mathematicians statisticians and actuaries	2909
Other professionals	2999

Table A2 Occupations included in symbolic analytic services (technical) category

Occupation description	ASCO 4-digit code (first edition)
Medical technical officers and technicians	3101
Science technical officers and technicians	3103
Electrical and electronic engineering associates and technicians	3201
Civil engineering associates and technicians	3203
Mechanical engineering associates and technicians	3205
Building, architectural and surveying associates and technicians	3207
Other engineering and building associates and technicians	3299
Aircraft pilots	3301
Air transport operating support workers	3303
Ship's pilots and deck officers	3305
Marine engineers and surveyors	3307
Inspectors and regulatory officers	3905

Table A3 Occupations included in in-person services (professional) category

Occupation description	ASCO 4-digit code (first edition)
Judges, magistrates and mediators	1103
Directors of nursing	1315
General medical practitioners	2301
Specialist medical practitioners	2303
Dental practitioners	2305
Pharmacists	2307
Occupational therapists	2309
Optometrists	2311
Physiotherapists	2313
Speech pathologists	2315
Chiropractors and osteopaths	2317
Podiatrists	2319
Radiographers	2321
Veterinarians	2323
Other health diagnosis and treatment practitioners	2399
Pre-primary school teachers	2401
Primary school teachers	2403
Secondary school teachers	2405
Special education teachers	2407
Tafe teachers	2503
Extra-systemic teachers and instructors	2505
Social workers	2601
Counsellors	2603
Lawyers	2605
Ministers of religion	2607
Psychologists	2903
Librarians	2911
Registered nurses	3401
Child care co-ordinators	3907

Table A4 Occupations included in in-person services (intermediate) category

Occupation description	ASCO 4-digit code (first edition)
Shop managers	1501
Restaurant and catering managing supervisors	1503
Accommodation and tavern managing supervisors	1505
Financial institution branch managers	1507
Other managing supervisors (sales and service)	1599
Police	3501
Welfare para professionals	3901
Ambulance officers	3909
Prison officers	3911
Sports persons and related workers	3915
Hairdressers	4927
Teachers' aides	5903
Securities and finance dealers	6101
Insurance brokers and agents	6103
Real estate salespersons and property managers	6105
Other investment, insurance and real estate salespersons	6199
Sales representatives	6201
Travel agents	6507
Enrolled nurses	6603
Dental nurses	6605

Table A5 Occupations included in in-person services (elementary) category

Occupation description	ASCO 4-digit code (first edition)
Receptionists and information clerks	5601
Telephonists	5603
Collection clerks	5901
Sales assistants	6301
Tellers	6401
Cashiers	6403
Ticket salespersons	6405
Street vendors, canvassers and sales drivers	6501
Bar attendants	6503
Waiters and waitresses	6505
Other salespersons	6599
Child care, refuge and related workers	6601
Home companions and aides	6607
Travel stewards	6609
Other personal service workers	6699
Bus and tram drivers	7101
Automobile drivers	7103
Ushers and door attendants	8901
Luggage porters	8903
Guards and security officers	8911
Caretakers	8913
Housekeepers	8915

Table A6 Occupations included in routine production services (advanced-skill) category

Occupation description	ASCO 4-digit code (first edition)
Performing arts support workers	3903
Other para-professionals	3999
Toolmakers	4101
Metal fitters and machinists	4103
Forging tradespersons	4201
Sheet metal tradespersons	4203
Structural steel, boiler making and welding tradespersons	4205
Metal casting tradespersons	4207
Metal finishing tradesperson	4209
Aircraft maintenance engineers	4211
Precision metal tradespersons	4213
Electrical powerline tradespers0ns	4301
Electrical fitters	4303
Automotive electricians	4305
Refrigeration and air conditioning mechanics	4307
Electrical mechanics	4309
Communications equipment tradespersons	4311
Radio and television servicers	4313
Office equipment and computer servicers	4315
Other electrical and electronics tradespersons	4399
Carpenters and joiners	4401
Bricklayers	4403
Painters, decorators and signwriters	4405
Plasterers	4407
Plumbers	4409
Roof slaters and tilers	4411
Wall and floor tilers	4413
Compositors	4501
Graphic reproduction tradespersons	4503
Printing machinists	4505
Binders and finishers	4507
Stereotypers and electrotypers	4509
Screen printers	4511
Vehicle mechanics	4601
Panel beaters	4603
Vehicle painters	4605
Vehicle body makers	4607
Vehicle trimmers	4609
Meat tradespersons	4701
Bakers and pastrycooks	4703
Cooks	4705
Other food tradespersons	4799
Nurserymen/women	4801
Greenkeepers	4803
Gardeners	4805
Wood machinists and turners	4901
Cabinetmakers	4903
Other wood tradespersons	4905
Marine construction tradespersons	4907
Blasting tradespersons	4909
Garment tradespersons	4911
Upholsterers and bedding tradespersons	4913
Shoemaking and repairing tradespersons	4915
Other leather and canvas tradespersons	4917
Floor coverers	4919
Glass tradespersons	4921
Jewellery and precious metalware tradespersons	4923
Craftworkers	4925
Sheep shearers	4929
Animal trainers	4931
Other tradespersons	4999
Fire fighters	7211

Table A7 Occupations included in routine production services (white-collar) category

Occupation description	ASCO 4-digit code (first edition)
Procurement officers	3913
Office secretaries and stenographers	5101
Typists and typist-clerks	5103
Word processing operators	5105
Business machine operators	5203
Accounting clerks	5301
Insurance and broking clerks	5303
Statistical and actuarial clerks	5305
Library and filing clerks	5401
Mail sorters	5403
Other filing, sorting and copying clerks	5499
Production recording clerks	5501
Transport recording and despatching clerks	5503
Stock and purchasing clerks	5505
Messengers and delivery officers	5605
Personnel clerks	5905
Legal and related clerks	5907
Postal clerks and officers	5909
Other clerks	5999

Table A8 Occupations included in routine production services (blue-collar) category

Occupation description	ASCO 4-digit code (first edition)
Data processing machine operators	5201
Truck drivers	7105
Locomotive drivers	7107
Excavating and earthmoving plant operators	7201
Forklift and related drivers	7203
Logging plant operators	7205
Paving and surfacing plant operators	7207
Agricultural plant operators	7209
Other mobile plant operators (except transport)	7299
Power generation plant operators	7301
Engine and boiler operators (except power generation)	7303
Chemical plant operators	7305
Petroleum and gas plant operators	7307
Bulk materials handling plant operators	7309
Crane operators	7311
Hoist, winch and lift operators	7313
Furnace and kiln operators	7315
Drilling plant operators	7317
Other stationary plant operators	7399
Basic metal products machine operators	7401
Metal press operators	7403
Other metal products machine operators	7405
Plastics production machine operators	7407
Rubber production machine operators	7409
Chemical production machine operators	7411
Wood processing machine operators	7413
Paper and paper products machine operators	7415
Glass production machine operators	7417
Clay and stone processing machine operators	7419
Yarn production machine operators	7421
Hide and skin processing machine operators	7423
Fabric production machine operators	7425
Textile sewing machinists	7427
Shoemaking machine operators	7429
Food processing machine operators	7431
Packaging machine operators	7433
Photographic products machine operators	7435
Other machine operators	7499

Table A9 Occupations included in routine production services (low-skill) category

Occupation description	ASCO 4-digit code (first edition)
Trades assistants	8101
Assemblers	8103
Hand packers	8105
Industrial spray painters	8107
Quality controllers	8109
Other trades assistants and factory hands	8199
Farm hands and assistants	8201
Forestry labourers	8203
Nursery and garden labourers	8205
Other agricultural labourers and related workers	8299
Cleaners	8301
Installation workers	8401
Concrete workers	8403
Structural steel and related construction labourers	8405
Earthmoving labourers	8407
Paving and surfacing labourers	8409
Survey hands	8411
Railway labourers	8413
Mining and mineral ore treating labourers	8415
Other construction and mining labourers	8499
Garbage collectors	8905
Storemen/women	8907
Freight and furniture handlers	8909
Laundry workers	8917
Kitchenhands	8919
Ward helpers	8921
Vehicle accessories fitters	8923
Fishermen/women, deckhands and seamen/women	8925
Other labourers and related workers	8999

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The *Monash University-ACER Centre for the Economics of Education and Training (CEET)* is a joint venture of Monash University and the Australian Council for Educational Research now in collaboration with the Department of Vocational Education and Training (DVET) at the University of Melbourne.

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- Phillip McKenzie (Principal Research Fellow, ACER, Director (Programs);
- Leo Maglen (Professor and Head of Department of Vocational Education and Training, University of Melbourne); and
- Chris Selby Smith (Professor, Department of Management, Monash University).

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5. **No longer available**.
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16. Anderson, D. (1997), *Student Perceptions of Career Development and Employment Services in TAFE.*
17. Madden, D. and Selby Smith C. (1997), *The Cost of Training in a Large Training Hospital: A Pilot Study.*
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Monographs and Other Publications
(prices as listed)

Anderson D. (1996), *Reading the Market, A Review of Literature on the Vocational Education and Training Market in Australia,* CEET, iv + 148 pages. $15.00

Burke, G., McKenzie, P. & Grauze, A. (1996), *Review of Statistical Data for Research on VET,* prepared for a Working Group established by the ANTA Research Advisory Council, CEET, xi + 90 pages. $5.00

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Selby Smith, C.& Ferrier, F. (Eds) (1996), *The Economic Impact of Vocational Education and Training,* AGPS, Canberra, v + 279 pages. $19.95

Shah, C. & Burke, G. (1996), *Student Flows in Higher Education*, Report prepared under the DEET EIP program, AGPS, Canberra, 94 pages. $5.00.
Also available on:
http://www.deetya.gov.au/divisions/hed/operations/shar-burke/front.htm

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